

Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.

a E 51
415

②

U.S.D.A.
NATL AGRIC LIBRARY
RECEIVED

An Archeological Reconnaissance
of Middle Havasu Canyon
Arizona

JUL 16 '80

PROCUREMENT SECTION
CURRENT SERIAL RECORDS

By
Robert C. Euler
and
Dee F. Green

With a Contribution by
Joseph C. Winter

Document Delivery Services Branch
USDA, National Agricultural Library
Nat Bldg.
10301 Baltimore Blvd.
Beltsville, MD 20705-2351

CULTURAL RESOURCES REPORT NO. 22

USDA Forest Service
Southwestern Region
August 1978

766170



PREFACE

This paper reports the results of a brief, 4-day archeological reconnaissance of a section of mid-Havasupai Canyon, a major south rim tributary of Grand Canyon, and an analysis of earlier hypotheses regarding the archeology of the area. At the time of the survey, the area under investigation was part of the Kaibab National Forest; it has since been added, by Congressional action, to the Havasupai Indian Reservation.

No previous archeological work had been done in the immediate area nor, for that matter, in Havasupai Canyon south (upstream) from the general vicinity of Supai Village. After receiving reports of "cliff dwellings" in the canyon, we decided to conduct the field work to determine, if possible, the temporal and cultural affiliations of the sites as well as their relation to the canyon physiography and environment.

We hoped, thereby, to add to our knowledge of Kayenta Anasazi-Cohonina-Havasupai affiliations, if any; general time of and reasons for abandonment of the sites; and cognates of cultural and environmental change.

CONTENTS

	<u>Page</u>
Preface	i
Acknowledgments	v
Introduction	1
General Description and Location	1
Environmental Setting	3
Geology	3
Vegetation	3
Fauna	5
Water	5
Trails	6
Survey Strategy	6
Site Data	9
AZ:B:14:7	9
AZ:B:14:8	16
AZ:B:14:9	16
AZ:B:14:10	17
AZ:B:14:11	20
AZ:B:14:12	20
AZ:B:14:13	23
AZ:B:14:14	23
AZ:B:14:15	23
AZ:B:14:16	27
AZ:B:14:17	27
AZ:B:14:18	27
AZ:B:14:19	29
AZ:B:14:20	32
AZ:B:14:21	32
AZ:B:14:22	32
AZ:B:14:23	32
AZ:B:14:24	32
AZ:B:14:25	33
AZ:B:14:26	33
AZ:B:14:27	33
AZ:B:14:28	33
AZ:B:14:29	33
AZ:B:14:30	33
AZ:B:14:31	33
AZ:B:14:32	34
Ceramics	35
Lithics	40
Perishable Artifacts	51
Nonartifactual Materials	52
Corn	53
Rock Art	57

	<u>Page</u>
Conclusions	58
Recovery of Cultural Data	58
Chronology Building and Culture History	58
Settlement and Subsistence Patterns	59
Archeological-Ethnic Relationships	60
Additional Research Problem	64

MAP

1. Havasu Canyon	2
------------------	---

TABLES

1. Ceramic Analysis Chart	36
2. Tools with Bifacial Retouch	42
3. Flake Morphology	43
4. Core Morphology	47
5. Lithic Materials	49
6. Havasu Canyon Maize Data	55
7. Comparison of Havasu Canyon Maize with Nearby Collections	56

FIGURES

	<u>Page</u>
Frontispiece - Expedition Helicopter landing in Havasu Canyon	
1. Views of Havasu Canyon	4
2. Structures and Rock Art at AZ:B:14:7	10
3. Sketch Map of AZ:B:14:7, Structures 1-12	11
4. Sketch Map of AZ:B:14:7, Structures 13-23	14
5. Sketch Map of AZ:B:14:9	18
6. Views of AZ:B:14:10 and 12	19
7. Sketch Map of AZ:B:14:12	21
8. Views of AZ:B:14:12 and 13	24
9. Sketch Map of AZ:B:14:13 and 14	25
10. Views of AZ:B:14:14 and 16	26
11. Sketch Map of AZ:B:14:15, 16, 18, and 22	28
12. Sketch Map of AZ:B:14:17	30
13. Views of AZ:B:14:13, 17, 18, and 31	31
14. Projectiles and Graver from Havasu Canyon	41
15. Bifacial blades from Havasu Canyon	48
16. Flakes and Ground Stone from Havasu Canyon	50

ACKNOWLEDGEMENTS

We wish to express our appreciation to the following for their help in conducting the survey and the preparation of this report: The Kaibab National Forest for logistic and personnel support--Keith Pfefferle, Sam Wolfskill, and Michael Wirtz were especially helpful; Merle Stitt, Superintendent of the Grand Canyon National Park for making Euler available and for the use of South Rim facilities as a staging area; Joseph Winter for his special analyses; the Museum of Northern Arizona for allowing inspection of their collections: and Donna Calkins and Joann Osborne for typing and overall husbanding the manuscript through the printer.

INTRODUCTION

During an aerial inspection of Middle Havasu Canyon, Michael Wirtz, then Recreation and Lands Staffman, Tusayan Ranger District, Kaibab National Forest, Arizona, noticed several prehistoric cliff structures along ledges near the canyon bottom. As a result, the Kaibab Forest asked the Southwestern Regional Office of the Forest Service to investigate the area in an effort to determine the nature and extent of the cultural resources present and to evaluate the potential for nomination to the National Register of Historic Places. Dr. Green was put in charge of the project and asked Dr. Euler to join him because of the latter's long association with the archeology of the area.

The expedition was mounted in October 1974 and lasted from October 1 to October 4. Equipment and personnel were ferried into Havasu Canyon using a National Park Service contract helicopter. Expedition personnel consisted of:

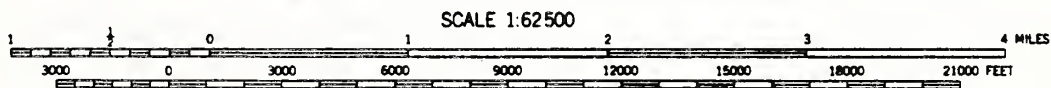
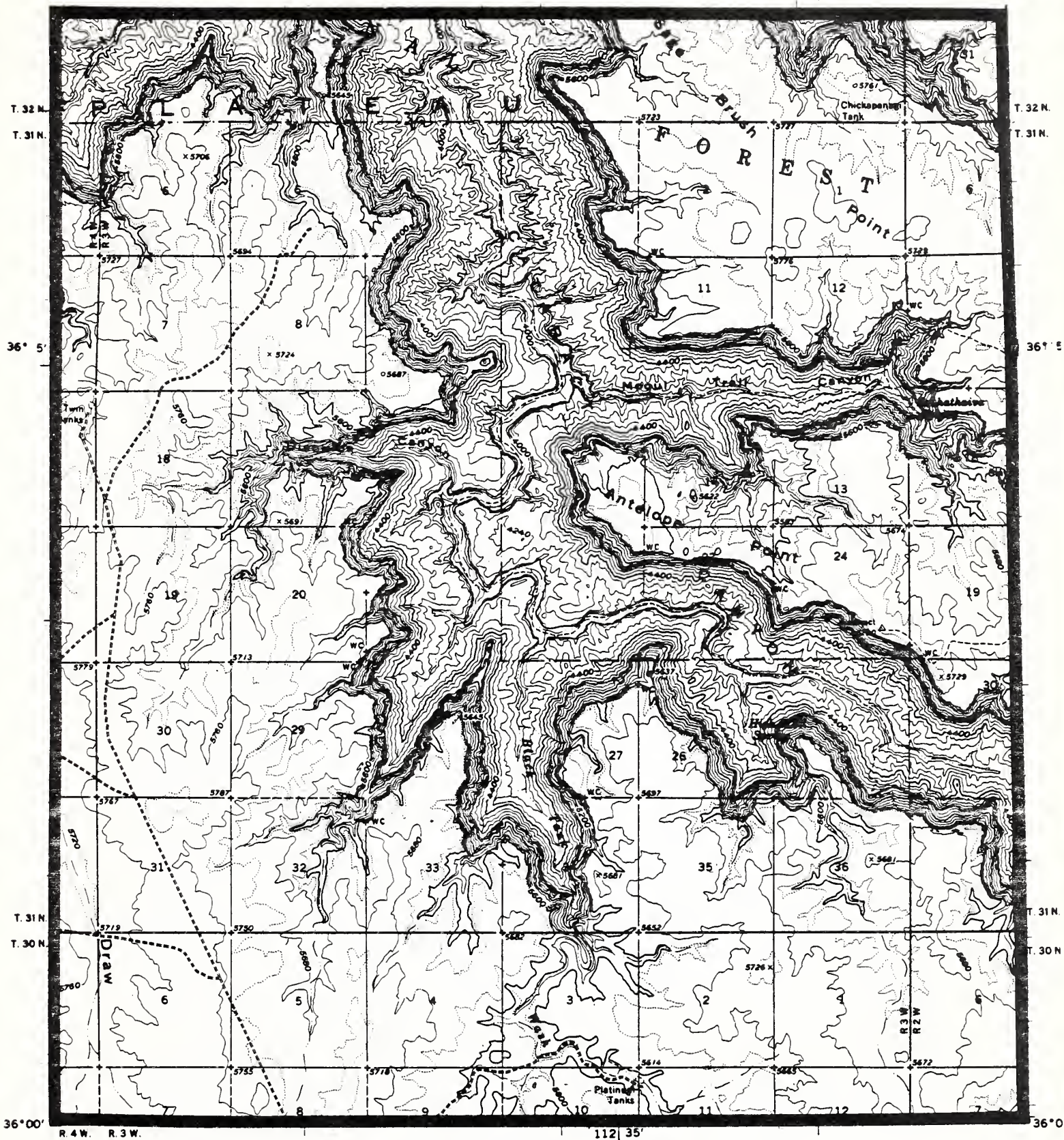
Dr. Dee F. Green, Regional Archeologist, USFS, Region 3
Dr. Robert C. Euler, Research Anthropologist, NPS,
Grand Canyon
Mr. Richard Spray, Recreation and Lands Staffman, USFS,
Region 3
Mr. Lou Armijo, Office of Information Staffman, USFS,
Region 3
Mr. Sam Wolfskill, Ranger, Tusayan Ranger District,
Kaibab National Forest
Mr. Michael Wirtz, Recreation and Lands Staffman, Tusayan
Ranger District, Kaibab National Forest

In addition, Keith Pfefferle, then Supervisor of the Kaibab National Forest, accompanied the initial flight and located the pictograph panel later recorded as site AZ:B:14:7.

General Description and Location

The ground survey was conducted within the confines of Havasu Canyon, Disquiba Canyon, an unnamed tributary, Black Tank Canyon, and High Wall Spring Canyon. In addition, aerial reconnaissance was done to the south and north of the ground survey; from Havatagritch Canyon to a point several miles south of Cactus Canyon where the narrowness of Havasu Canyon made helicopter flight impossible.

Havasupai Canyon (also known as Cataract Canyon) is a tributary of Grand Canyon which heads near Williams, Arizona, and flows north. The survey area lies in the lower middle portion of the canyon. In deference to the wishes of the Havasupai Tribe, specific locations of ruins are not given. Entry to the area is possible only by written permission from the Havasupai Tribal Council.



CONTOUR INTERVAL 80 FEET
 DOTTED LINES REPRESENT 40-FOOT CONTOURS
 DATUM IS MEAN SEA LEVEL



Environmental Setting

Geology

In the Specific section of Havasu Canyon in which we worked, the geology is relatively uncomplicated. The canyon here consists of two primary profiles. The outer cliffs are marked by the rim-forming Permian Kaibab Formation, primarily limestone. The rim of the canyon is at an elevation of 1707 meters. The rim and plateau behind it are relatively flat or occasionally undulating, often marked by shallow, meandering canyons cut in the Kaibab limestone. (Figure 1, a.)

Below this are the Toroweap formation, the Coconino sandstone, and the Hermit shale. The first three formations form essentially sheer cliffs, while the Hermit is more sloping. The Hermit slope is steep and usually obscured by detritus from the cliffs above. (Figure 1, b.)

Below the Hermit shale, the reddish Supai formation appears at an elevation of 1219 meters. This is marked by relatively broad (a few to approximately 200 wide), erosion-cut terraces of Esplanade sandstone culminating in sheer cliffs and steep talus slopes averaging 50 meters in height. In some places, these essentially bare rock terraces are rounded, with small buttes of red sandstone protruding above. Generally, however, they are more flat and dissected by numerous small canyons. The Supai cliffs form the inner profile of Havasu Canyon (Figure 1, c) and are between 100 and 250 meters apart.

The canyon floor (Figure 1, d) is primarily comprised of alluvium sands and silts of decomposed Supai material which has been subjected to periodic flooding. At the mouth of each tributary and extending down the main canyon some hundreds of meters, this finer alluvium is covered by masses of flood-transported boulders of varying sizes that tend to obscure the present channel of Havasu Canyon. The arroyo marking this channel is no more than 2 meters incised and, in some sections, appears to be aggrading.

Our ground reconnaissance was restricted to the canyon bottom and to the colluvium talus slopes and cliffs of the inner canyon Supai formation with occasional random forays along the Esplanade terraces. It is highly unlikely that sites would be found in the steep or sheer-walled, overlying Hermit, Coconino, Toroweap, or Kaibab formations. In fact, with two exceptions all sites were located in overhangs in the inner Supai cliffs. One structure (AZ:B:14:19) was recorded on the Esplanade, and another (AZ:B:14:17) was exposed in the alluvium near the canyon floor. The repeated flooding of the bottom lands may well have virtually destroyed all other than recent cultural evidence there.

Vegetation

The principal authors of this report, both active participants in the Southwestern Anthropological Research Group (SARG), have used a gross vegetation classification, that of Küchler (1964), according to a previously



a



b



c



d

Figure 1 -- a. General view of the Canyon showing the Kaibab, Toroweap, Coconino Sandstone, and Hermit Shale Formations in the background. b. Inner Canyon Supai Formation. c. Cliffs of the inner canyon Supai Formation Site AZ:B:14:12 can be seen on the cliff ledge. d. Floor of the canyon showing alluvial sand bed.

agreed upon SARG format (Gumerman 1971:15). This is hardly satisfactory for our present purposes because, according to the Klüchler scheme, the area under consideration would be classed as pinyon-juniper woodland. In fact, there is scarcely a juniper tree to be seen anywhere in the study area.

One could use another major classificatory system, that of Lowe and Brown (1973). This computerized format (Brown and Lowe 1974) relates solely to the natural vegetation of Arizona. Lowe and Brown (1973:30) have mapped Havasu Canyon as Great Basin Desertscrub and have noted its principal flora as ". . . sagebrush, blackbrush, . . . shadscale . . . rabbitbrush, horsebrush, winterfat, and mormon-tea"

Our own observations revealed a generally sparse vegetation throughout the study area. Along the alluvial canyon floor were various small grasses, prickly pear (Opuntia sp.), nightshade (Solanum sp.), snakeweed (Gutierrezia sp.), and four-wing saltbush (Atriplex canescens). Russian thistle (Salsola Kali), the result of recent overgrazing, also occurred in this sector. This grazing, by Havasupai horses and cattle, is probably the major impact upon the vegetation.

On the immediate fringes of the main channel were catclaw (Acacia greggi), the exotic tamarix (Tamarix pentandra), and jimsonweed (Datura stramonium). Indeed, the latter also was found growing in aggrading spots in the channel itself. (Figure 1, b)

On the first talus slopes leading to the Supai sandstone cliffs, the vegetation consisted essentially of small grasses, Mormon tea (Ephedra viridis), prickly pear (Opuntia sp.), beargrass (Nolina microcarpa), yucca (Yucca baccata), blackbrush (Coleogyne ramosissima), and an occasional agave (Agave utahensis). Wolfberry (Lycium pallidum) occurs expectably upon some talus middens.

A similar association, although less plentiful, was found on the Supai terraces. An occasional stunted juniper (Juniperus monosperma) was noted here also.

Fauna

In view of scarcity of water in this reach of Havasu Canyon, we were surprised to note that the principal observable animal (aside from horses) was the mule deer (Odocoileus hemionus). During both ground and aerial reconnaissance, we counted over 50, both adult males and females. These were mostly concentrated within a few kilometers of water. Undoubtedly, many rodents and reptiles escaped our notice but we did see a few lizards and one large rattlesnake (Crotalus molossus?).

Water

Presently, water resources in the study area are minimal. Only one, High Wall Spring, is flowing and is the best water source available. There are, in addition, a number of very small seeps located in the Supai cliffs

on both sides of the canyon, but their drips were few. No water was found in the streambed, but it is possible that water is available within a meter below the surface.

Trails

There are but limited routes of foot and horseback access to middle Havasu Canyon. In addition to arduous hiking up and down the main canyon, from the Walapai and Topocoba trails closer to Supai Village and the "Bach-a-the-too-iva" trail out the upper end of the main canyon, there are but two trails through cliffs or side canyons to the plateau in this immediate reach. One is the Moqui trail which leads to the east rim of the canyon. As the name implies, in aboriginal and historic times, this constituted a primary route of Hopi-Havasupai trade and visitation. This was probably the route out of the canyon taken by the Spanish explorer-priest Francisco Garces in June of 1776 (Coues 1900:346).

The second route, approximately 2 kilometers up the canyon from High Wall Spring, is known to the Havasupai as the "Klap-la-pa" trail. This involves a series of very steep zig-zags up a talus and then a traverse along a ledge in the Kaibab Formation before access to the west rim of the plateau is gained. It was the route followed in June 1881 by Lt. Col. William Redwood Price and a detachment of cavalry when the first survey of the original Havasupai Reservation was made (Price 1881).

Survey Strategy

Due to the roadless nature of the survey area, a combination of helicopter and foot coverage was used. On the first flight into the canyon (October 1), about 30 minutes of flight time was used to locate ruins and a base camp. The area covered was the main canyon from High Wall Spring to Moqui Trail Canyon and Disquiba Canyon. Base camp was located on the canyon floor just upstream from the junction of Moqui Trail Canyon and beneath an extensive ledge ruin (AZ:B:14:7). On October 2, base camp was moved upstream to a point between Disquiba and Black Tank Canyons where an unnamed tributary enters Havasu Canyon. Helicopter reconnaissance was then conducted up Moqui Trail Canyon, down Havasu Canyon to its junction with Havatagvitch Canyon, and back upstream as far as Cactus Canyon. Black Tank Canyon and the unnamed tributary between Black Tank and Disquiba Canyons were also flown. The flight strategy employed was to fly down the canyon at an altitude of about 10-15 meters above the canyon floor. Ruins or rock art sites which were observed were marked on a USGS Quadrangle (Supai) by Euler. The return flight up canyon was flown from 30-50 meters above the canyon floor which allowed a view of the upper ledges and the terrace/talus lands above. The higher walls of the canyon which do not form ledges and alcoves were not inspected. On October 4, the final flight out included a reconnaissance of Cactus Canyon and the upper portions of Havasu Canyon which are not yet mapped.

Four foot surveys were conducted. On October 1, Spray and Wirtz walked upstream from the Moqui Trail base camp as far as Black Tank Canyon. No sites were recorded, but several sites which were documented on October 2 and 3 were located and visited. These included sites which had been

seen earlier in the morning during the helicopter reconnaissance. On October 2, the entire party surveyed downstream from the unnamed tributary camp to the mouth of Disquiba Canyon. Three sites were recorded on this survey.

On October 3, two survey parties went out. Green, Spray, and Wirtz hiked up the canyon to High Wall Spring and recorded sites in the vicinity and along the south wall of Havasu Canyon between the mouth of High Wall Spring Canyon and where the precipitous Klap-la-pa trail enters Havasu Canyon. A number of sites were noted and a few recorded between High Wall Spring and base camp. Euler and Wolfskill surveyed and recorded sites downstream from base camp to Moqui Trail Canyon and in Disquiba Canyon. On October 4, several sites in the vicinity of the base camp were recorded. A total of 26 sites were assigned numbers and about that many observed but not recorded.

The helicopter reconnaissance indicated that the majority of sites which are visible in ledges are located between High Wall Spring and Moqui Trail Canyon. Only a few sites were noted from the air above and below these points. As a result, the foot survey concentrated in the area between the trail above High Wall Spring and Moqui Trail Canyon. No foot survey was conducted up or down the canyon beyond those points.

In the more extended aerial examination, we noted two mesquite pits in lower Moqui Trail Canyon, two single masonry rooms, and a small linear rock alignment (a prepared farming terrace?) in Havasu Canyon about 2 kilometers below the junction of Moqui Trail Canyon. Above Cactus Canyon, only three small granaries were observed. The helicopter reconnaissance was complete within the boundaries indicated although more sites could probably be discovered by repeated flights. The foot surveys have only sampled the area at less than 10% of an intensive survey level. Nonetheless, it seems clear that sites in this area are concentrated with direct relation to available water supplies and routes of access from the canyon bottom to the plateau above.

Initially, we anticipated one or more additional expeditions to complete the recording of sites discovered and to gather additional data, both archeological and environmental. However, in January 1975, the survey area was transferred from National Forest administration to the Havasupai Tribe. This, therefore, constitutes the final report insofar as the Forest Service is concerned with the area. Obviously, much more remains to be done, and the area has great archeological research potential. However, the Forest Service will now leave such activities to others. After the expedition, it was decided that the district merited nomination to the National Register of Historic Places. Forms were filled out and sent to the Arizona State Historic Preservation Officer for her opinion. With the transfer of the land from National Forest control, the nomination question has also been left to the new landholders and the Arizona State Historic Preservation Officer.

The remainder of this report concerns itself with the site descriptions prepared by Green. Euler performed the analyses of the ceramics and perishables. Green analyzed the lithic materials, and Joseph C. Winter, the corn cobs. The conclusions were written by Euler and Green. Site maps and artifact illustrations are by Green, photos are by Armijo and Euler.

SITE DATA

Site numbers are Arizona quadrangle numbers assigned by Euler in the Grand Canyon Archeological Survey. All artifacts and permanent records are on file there.

Site No. AZ:B:14:7

Survey began on the downstream (east) end of the site, and the structures (Figures 2-4) and petroglyph panels are numbered upstream. All structures and petroglyph panels on this site were photographed by Lou Armijo.

Structure 1. Circular structure with a single course of stone showing on the surface. One upright slab. Probably a granary.

Measurements: 2.60 meters east-west
2.60 meters north-south

Structure 2. Roughly circular with two upright slabs showing. Probably a granary. Upstream (west) wall missing. Measurements are estimates (Figure 2, b).

Measurements: 4.20 meters east-west
4.30 meters north-south

Pictograph Panel A. Single, white-painted design on alcove face over structure 2.

Measurements: 24½ cm long x 12 cm high

Pictograph Panel B. On alcove face 11 meters downstream (east) of structure 3. Four figures in the panel all painted in white. One human figure.

Petroglyph Panel C. Five meters downstream (east) from structure 3. About 8 abstract designs.

Pictograph Panel D. Above structure 3. Twelve to 15 figures including a large human figure, two circles and a hand in negative (Figure 2, c).

Structure 3. Semicircular granary. Mortar is not well crushed shale which is inner-bedded in sandstone. Intact entry faces directly south. Contiguous with structure 4.

Measurements: 2.10 meters east-west
1.32 meters north-south



a



b

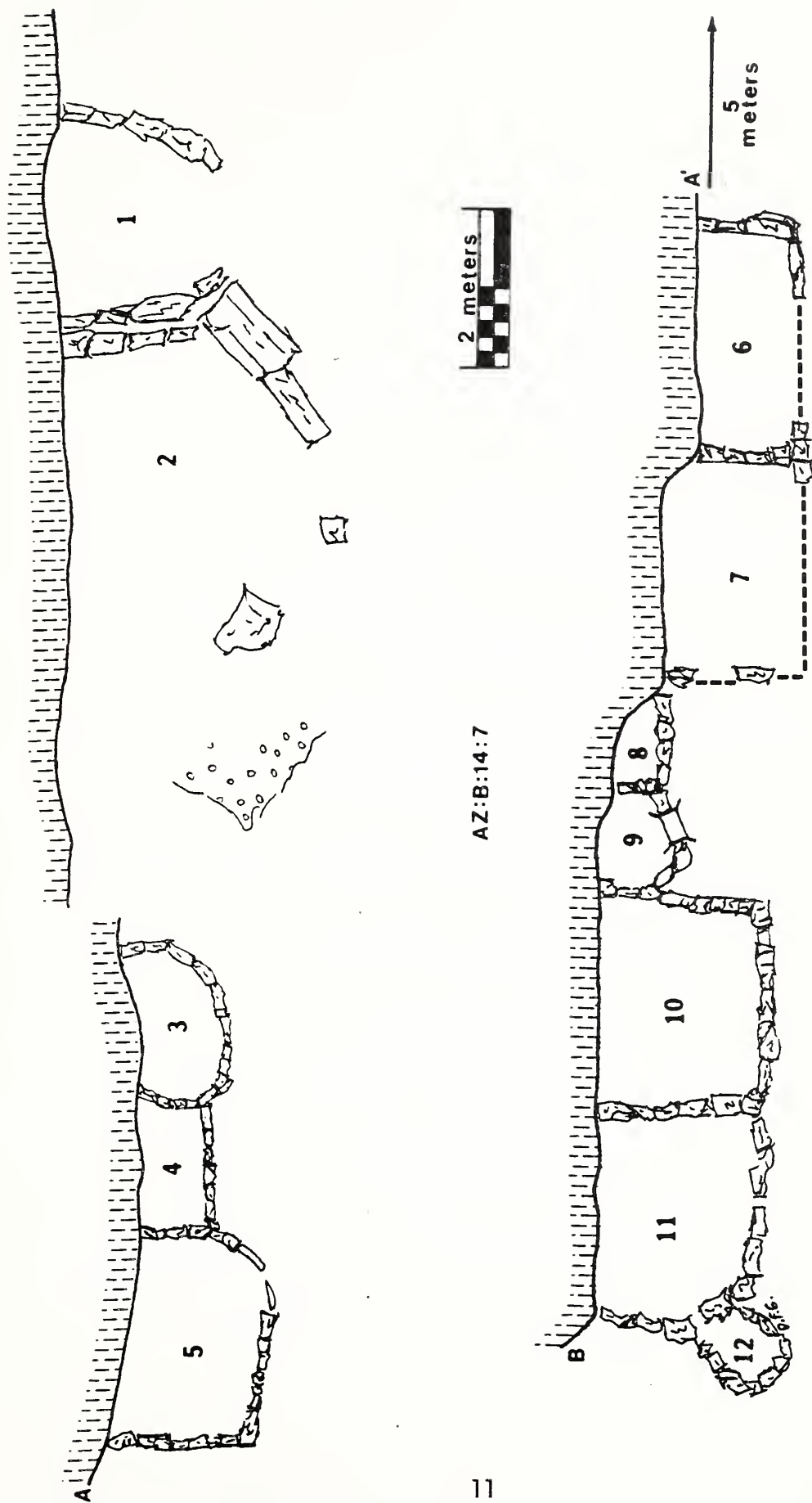


c



d

Figure 2 -- a. View along ledge of Site AZ:B:14:7. b. Exterior wall of Room 11, Site 7. c. Pictograph panel D, Site 7. d. Petroglyph panel I, Site 7.



AZ:B:14:7

Figure 3 -- Sketch Map of Site AZ:B:14:7, Structures 1-12.

Structure 4. Construction similar to structure 3. Granary with a large sandstone slab running along the back of the room. The slab extends into structure 5. It appears to cover something since the walls of the structures on either outside face extend below the level of the slab. Contiguous with structures 3 and 5.

Measurements: 1.55 meters east-west
.95 meters north-south

Structure 5. Granary with construction similar to structure 3. Contiguous with structure 4. Their joint wall is 1.12 meters high and has 11 courses.

Measurements: 2.80 meters east-west
1.78 meters north-south

Petroglyph Panel E. Probably Havasupai petroglyph. A single elongated animal more scratched than pecked. On alcove face between structures 5 and 6.

Pictograph Panel F. One white painted animal on alcove face above structure 6. Several peculiar dark blotches may also be painted.

Structure 6. Granary with one course of masonry remaining. Five meters upstream (west) from structure 5.

Measurements: 3.05 meters east-west
1.50 meters north-south

Structure 7. Granary with single course of masonry contiguous with structure 6.

Measurements: 2.70 meters east-west
2.20 meters north-south

Petroglyph Panel G. Seven or eight petroglyphs above structure 8. Human figures and circles included.

Structure 8. Small granary just upstream (west) of structure 7. Contiguous with structure 9.

Measurements: 1.10 meters east-west
.65 meters north-south

Structure 9. Small granary upstream (west) and contiguous with structure 8.

Measurements: 1.30 meters east-west
1.30 meters north-south

Door stoop is intact and measures .40 meters wide.

Structure 10. Living area of single stone wide coursed masonry contiguous with structures 9 and 11.

Measurements: 2.53 meters east-west
2.13 meters north-south

Structure 11. Living area of single, stone coursed masonry contiguous with structures 10 and 12.

Measurements: 2.53 meters east-west
2.13 meters north-south

Structure 12. Small storage room which lies inside structure 13 but is storage for structure 11.

Measurements: 1.15 meters east-west
1.00 meters north-south

The following writing left by Havasupai Indians appears above structure 11 and 12.

3/9/43
L.S. Lorenzo Sinyella?

3/11
Roy Sinyella

Structure 13. Large living area. Back wall is composed of purple shale which has been cut vertically. It was probably mined for mortar and/or to enlarge the living space. Masonry is similar to all other structures. Roof of alcove shows fire blackening. This structure and structure 14 have deepest alcove contiguous with structures 11 and 12.

Measurements: 4.05 meters east-west
4.82 meters north-south

Hallway: Between structures 13 and 14 is a hallway which measures 1.25 meters wide and 2.85 meters deep (north-south).

Structure 14. Living area contiguous with structures 15 and 16.

Measurements: 2.00 meters east-west
2.80 meters north-south

Structure 15. Granary contiguous with structure 14.

Measurements: .70 meters east-west
1.25 meters north-south

In the vicinity of structures 11 through 15, two milling stones were noted along with three metates. The metates were troughed with one end open. They were not collected.

Structure 16. Small granary with a coat of plaster intact on the west and north walls. These two walls are under the alcove and well protected.

Measurements: 2.00 meters east-west
1.60 meters north-south

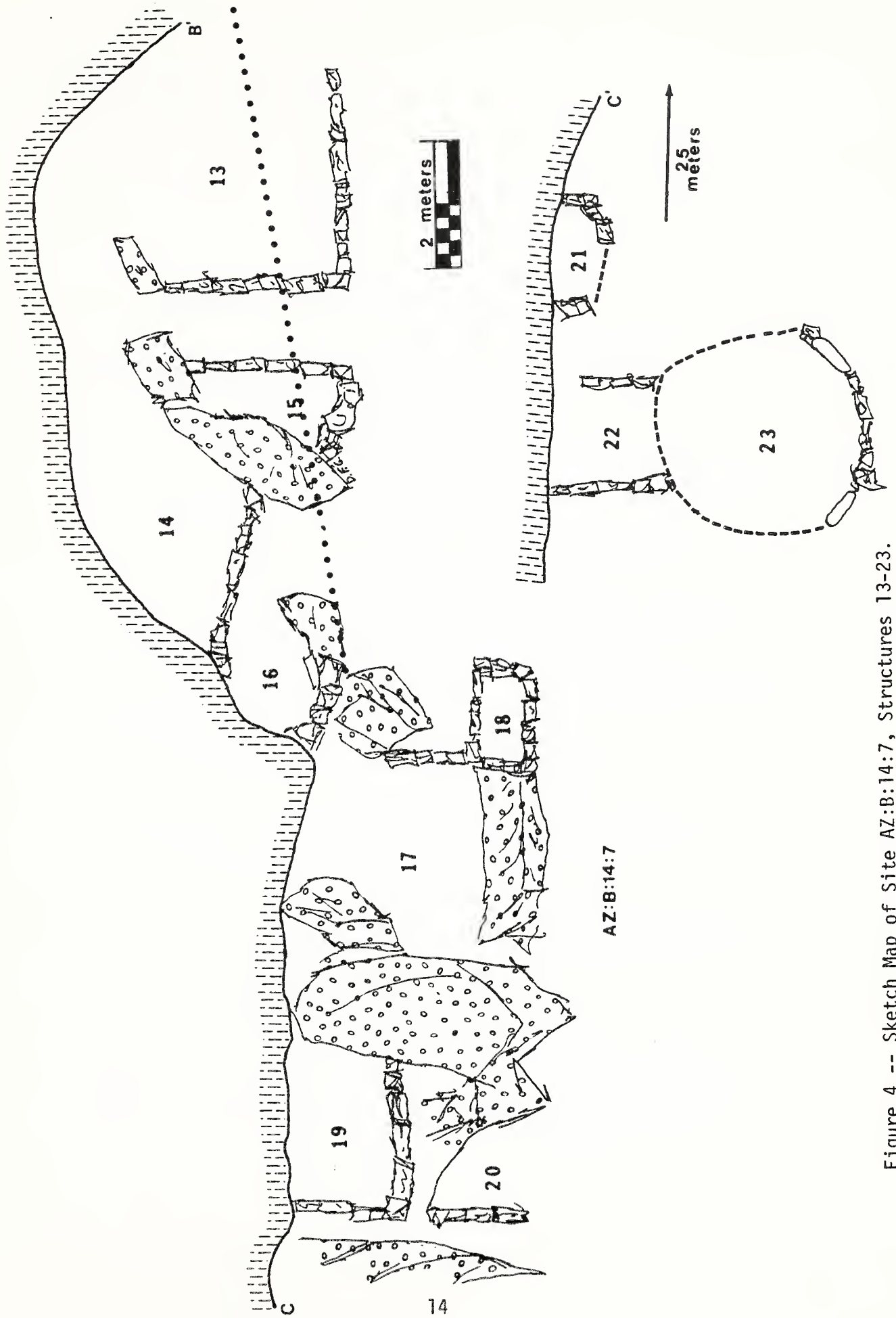


Figure 4 -- Sketch Map of Site AZ:B:14:7, Structures 13-23.

Structure 17. Living area with a small granary (structure 18) in front. Rear of this structure abuts structure 16. However, this structure is out of the good alcove cover of structures 13 through 16 and in more of a ledge environment.

Measurements: 2.90 meters east-west
3.20 meters north-south

Structure 18. Small granary on a boulder in front of structure 18.

Measurements: 1.30 meters east-west
.85 meters north-south

Structure 19. This room is situated on a large boulder pile next to and upstream from structures 19 and 20.

Measurements: 2.50 meters east-west
1.65 meters north-south

Structure 20. Located just in front of and below structure 19 on the rock pile, only a single upstream (west) wall is present. Cannot determine where the east wall was.

Measurements: 1.60 meters north-south (this appears to be only part of the wall).

Petroglyph Panel H. Above structure 19. The panel includes a hunting scene as well as a snake and some other figures.

Structure 21. Small ledge granary about 25 meters upstream (west) from structure 20.

Measurements: 1.20 meters east-west
.95 meters north-south

Structure 22. Small granary next to structures 21 and 23.

Measurements: 1.90 meters east-west
1.80 meters north-south

Structure 23. Living area is in front of structure 22, possibly circular but with three upright slabs along with some smaller stones.

Measurements: 3.65 meters east-west
2.90 meters north-south

Petroglyph Panel I. Largest panel on the site, on a large flattopped boulder about 20 meters from the cliff face and about 50 meters upstream from structure 23. All the figures are pecked and they include human figures, spirals, bird tracks, geometric figures (Figure 2, d).

Site No. AZ:B:14:8

Locus 1. A shelter 4 x 7 meters about 20 meters above the canyon floor. There is no visible architecture, but a lot of sherds scattered down the talus in front of the shelter. There is some fill in the shelter, perhaps 1 to 2 meters, and subsurface occupation may be present. Lycium, which grows on disturbed soil, is growing on the talus just in front of the alcove.

Locus 2. Granary on ledge about 50 meters above canyon floor. Construction similar to site 7. The structure is mostly fallen with only the upstream wall well intact. This wall has upright base slabs.

Measurements: 2.00 meters east-west
1.70 meters north-south
1.10 meters fill to overhang

Locus 3. Circular structure, kiva or habitation. There are some large stones set upright in the west (upstream) end. There appears to be some fill, and there is no disturbance. This site is very good for testing. Euler noted more decorated sherds here than at other loci. This alcove is upstream from locus 2. There is a pictograph panel in a crevice on the downstream side of the structure. Figures appear to be all geometric or stylized. They are painted in red and white with the majority in red.

Locus 4. Large alcove upstream from locus 3. Contains some white pictographs on the downstream face. No evidence of structures and only a few surface artifacts including a worked piece of wood. Some charcoal washing out. There is a lot of ceiling fall; the fill might be 1 meter deep in spots.

Site No. AZ:B:14:9

Locus 1. Evidence of relatively recent seep 10 meters downstream.

Structure 1. A coursed masonry ledge granary.

Measurements: 2.50 meters east-west
1.20 meters north-south

Structure 2. Coursed masonry ledge granary.

Measurements: 1.90 meters east-west
1.60 meters north-south

Both structures 1 and 2 (Figure 5) use sandstone and travertine in their wall construction. There is a deposit of travertine 3 meters upstream from structure 2.

Locus 2. This is about 60 meters upstream from locus 1.

Structure 2. Coursed masonry granary contiguous with structure 1.

Measurements: 2.20 meters east-west
.70 meters north-south

Locus 3. This is about 50 meters upstream from locus 2.

Structure 1. Coursed masonry granary with six courses high remaining.

Measurements: 1.50 meters east-west
1.50 meters north-south
Entry way measures 35 centimeters wide and
30 centimeters deep.

Structure 2. Coursed masonry granary badly fallen with only one course remaining.

Measurements: 1.10 meters east-west
1.20 meters north-south

Structure 3. Coursed masonry granary with five courses remaining. Several corn cobs collected in the granary. Tip of obsidian point found on ledge in front of this structure.

Measurements: .55 meters east-west
1.10 meters north-south

Structure 5. Coursed masonry granary contiguous with structure 6.

Measurements: .70 meters east-west
1.30 meters north-south

Structure 6. Habitation or living area of coursed masonry construction. Structures 4 and 5 are located behind this structure. Walls remain only one course high. Not well preserved. Fragmentary manos and metates observed but not collected.

Measurements: 2.50 meters east-west
3.40 meters north-south

A probable Havasupai petroglyph is located on the ledge wall between structures 2 and 3. It is a spider web figure around a natural hole in the sandstone.

Site No. AZ:B:14:10

There is a single room of coursed masonry which appears to have been a habitation area (Figure 6, a).

Measurements: 2.40 meters east-west
2.90 meters north-south

The site is on a ledge about 50 meters above the canyon floor. There are some white pictographs near the structure including several hands (Figure 6, b). One corn cob was found at this site. Just upstream from the structure is a small ledge with a rock retaining wall about eight courses high. It cannot be reached except with climbing gear. This retaining wall guards the only approach to the ledge above, which contains a large petroglyph panel first seen by Keith Pfefferle on the first helicopter trip in.

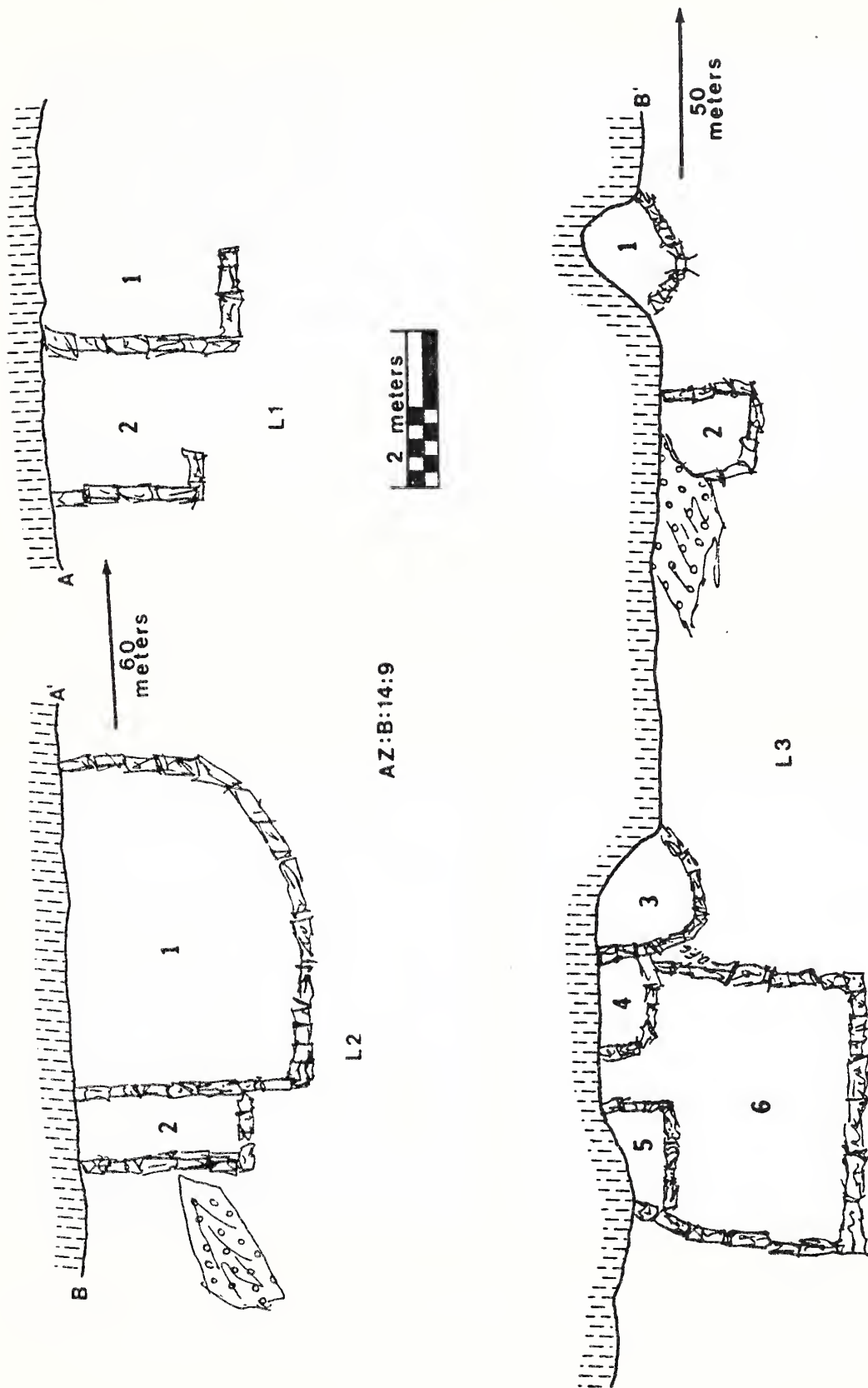


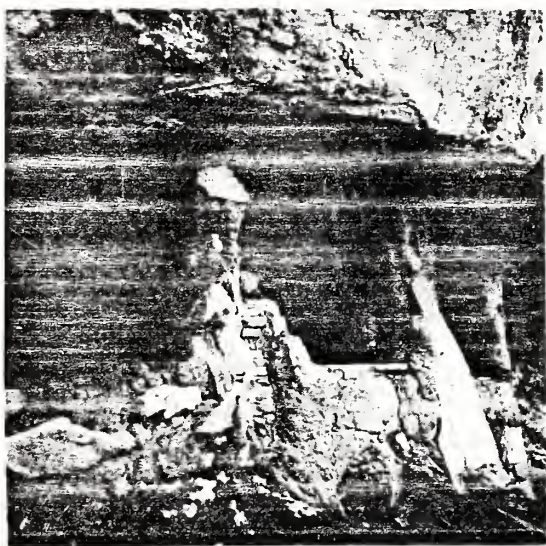
Figure 5 -- Sketch Map of Site AZ:B:15:9.



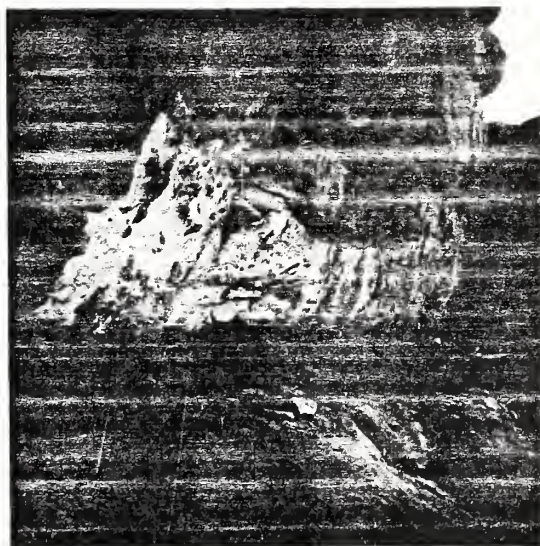
a



b



c



d

Figure 6 -- a. Masonry Room at Site AZ:B:14:10. b. Pictographs at Site 10. c. View along ledge at site AZ:B:14:12. d. Rooms 8-10 at Site 10.

Site No. AZ:B:14:11

A large pictograph panel in white including circle and several human figures. We could not reach the ledge--climbing gear needed. Euler photographed with a telephoto lens. The panel is on the west wall of the canyon about 100 feet above the canyon floor.

Site No. AZ:B:14:12

This site consists of a series of rooms mostly granaries but with at least one living area (Figure 7). The rooms are on a ledge about 45 meters above the canyon floor in locus 1. A second locus consisting of two rooms is located about 23 meters below the upper rooms on a small shelf with an active seep.

Locus 1.

Structure 1. Upright slab structure badly eroded.

Measurements: 2.00 meters east-west
(approximate) 3.00 meters north-south

Structure 2. Coursed masonry granary with a shelf on the inside of one wall. It abuts structure 3.

Measurements: 1.20 meters east-west
1.30 meters north-south

Structure 3. Granary abutting structures 2 and 4, but the wall with 4 is missing.

Measurements: 2.00 meters east-west
2.85 meters north-south

Structure 4. Granary abutting structures 3 and 5.

Measurements: 1.50 meters east-west
2.20 meters north-south

Structure 5. Living area with fireplace remnant exposed in the floor fill. The firepit measures 80 centimeters in diameter. This room is contiguous with structures 4 and 6.

Measurements: 3.20 meters north-south
4.00 meters east-west

Structure 6. Granary contiguous with structure 5.

Measurements: 2.40 meters east-west
3.30 meters north-south

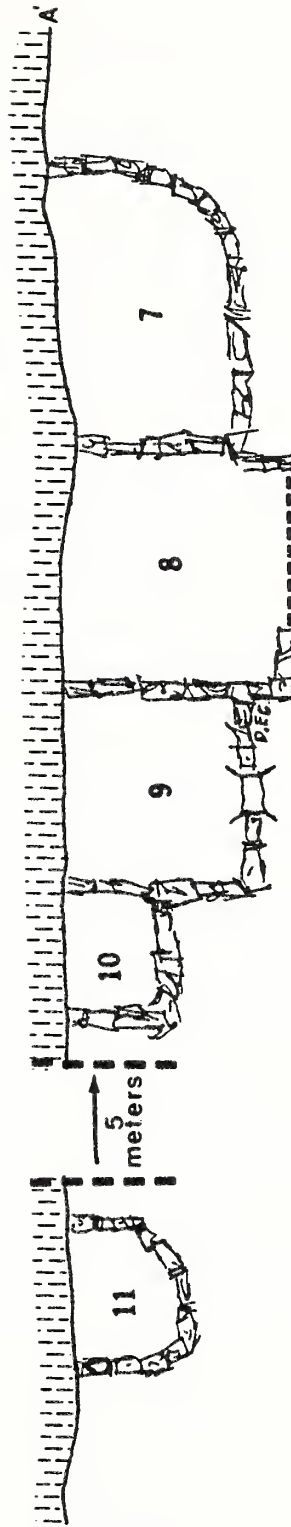
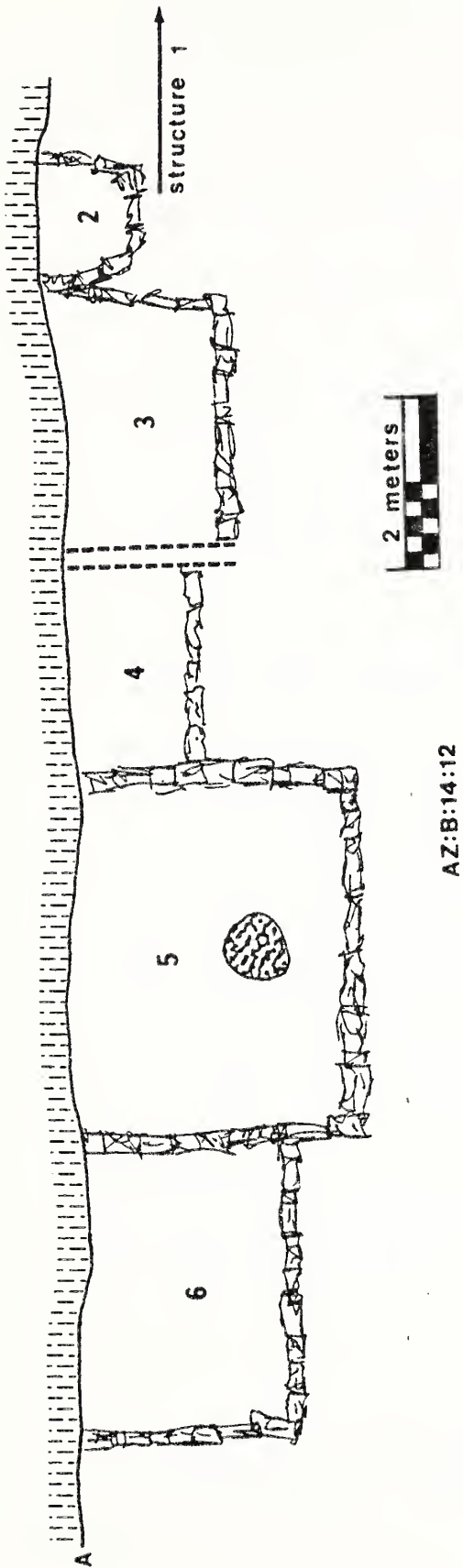


Figure 7 -- Sketch Map of Site AZ:B:14:12.

Structure 7. A granary about 3 meters upstream from structure 6 and on the same ledge. It abuts structure 8 and has 11 narrow courses of rock.

Measurements: 1.70 meters east-west
2.70 meters north-south

Structure 8. A granary contiguous with structures 7 and 9. The front wall is broken down.

Measurements: 2.10 meters east-west
2.30 meters north-south

Structure 9. Granary with well processed upright slabs. This structure abuts both structures 8 and 10 (Figure 6, d).

Measurements: 1.80 meters east-west
1.90 meters north-south
Doorway: .50 meters wide
.65 meters high
.25 meters deep

Structure 10. Well preserved granary abutting structure 9. The doorway shows definite impressions from the door hatch covers (Figure 6, d).

Measurements: .90 meters east-west
1.00 meters north-south
Doorway: .50 meters wide
.70 meters high
.15 meters deep

Structure 11. A single granary about 5 meters upstream from structure 10 (Figure 8, a). The ledge ends just beyond the structure and is impassible.

Measurement: 1.1 meters east-west
1.3 meters north-south

Locus 2.

Structure 1. This room is located near the seep which appears to have been larger in the past. The room is probably a granary or perhaps water storage.

Measurements: 2.05 meters east-west
2.40 meters north-south

Structure 2. This room is located about 5 meters upstream from structure 1. The east wall is missing, but the room appears to have been about 4 meters east-west. A north-south measurement was not possible.

Site No. AZ:B:14:13

This site is located about 50 meters above Havasu canyon floor. It consists of two structures, a mescal pit, and a pictograph panel (Figure 9).

Structure 1. A habitation room with coursed masonry walls (Figure 8, b). Seven courses remain, a few of which show mortar remnants. The roof above the structure is smoke blackened.

Measurements: 3.7 meters east-west
4.4 meters north-south

Structure 2. This is a habitation room with two eroded walls remaining.

Measurements: 3.2 meters east-west
3.7 meters north-south

Pictograph panel includes a modern Havasupai rendition of deer (Figure 8, c) executed in charcoal and four prehistoric spray outline hands (Figure 8, d). The mescal pit, which is eroding, occurs down slope near structure 1.

Site No. AZ:B:14:14

This site consists of two granaries (Figure 9) not far from site AZ:B:14:13. The architecture involves a mixing of both coursed masonry and slabs extending from floor to roof of a steeply sloping overhang (Figure 10, a-b).

Structure 1.

Measurements: 1.6 meters east-west
2.2 meters north-south

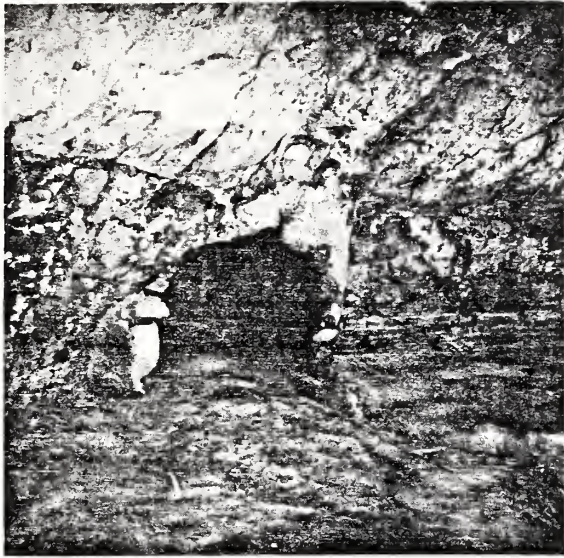
Structure 2.

Measurements: 0.70 meters east-west
1.50 meters north-south

Site No. AZ:B:14:15

This site is a one-room (Figure 11) coursed masonry granary. The structure is six courses high and appears to be of dry wall construction. It is located on the first ledge above the talus slope about 30 meters above the canyon floor.

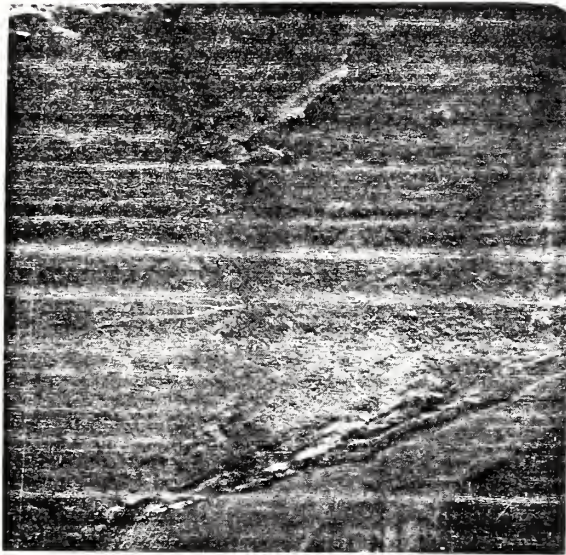
Measurements: 2.4 meters east-west
1.5 meters north-south



a



b



c



d

Figure 8 -- a. Granary at Site AZ:B:14:12. b. Structure 1 at Site AZ:B:14:13. c. Havasupai pictograph rendered in charcoal Site 13. d. Negative hands pictograph in white paint, at Site 13.

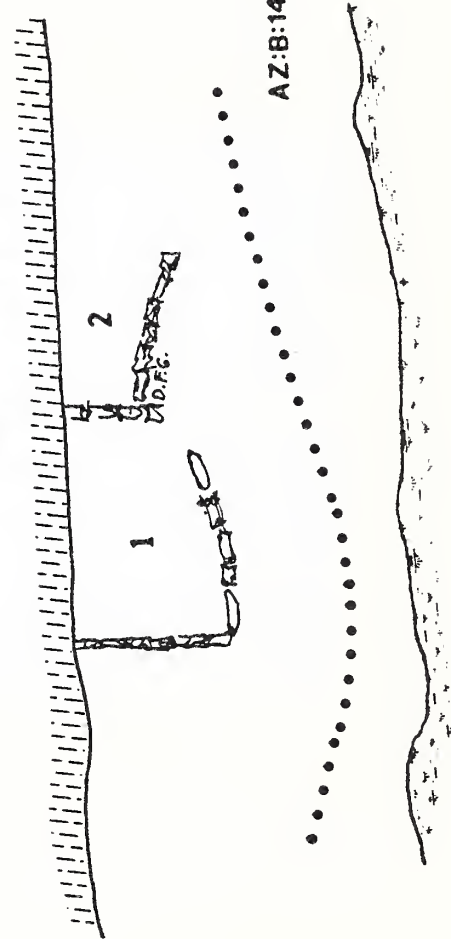
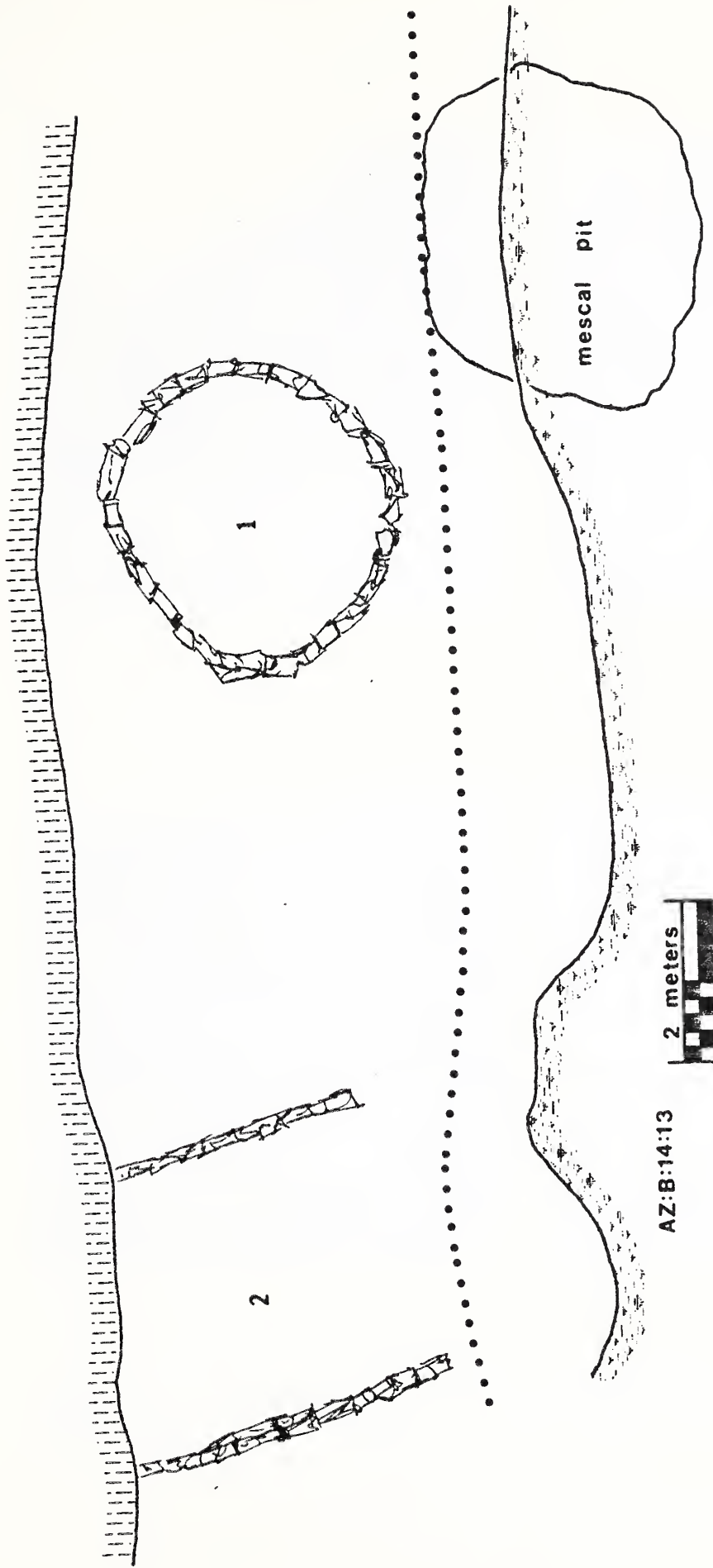
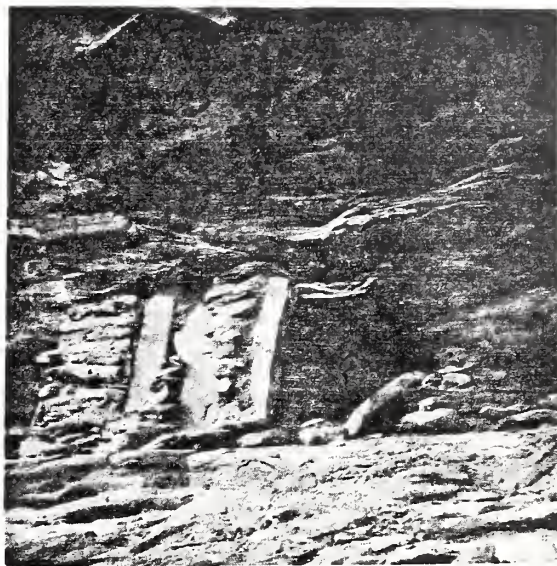


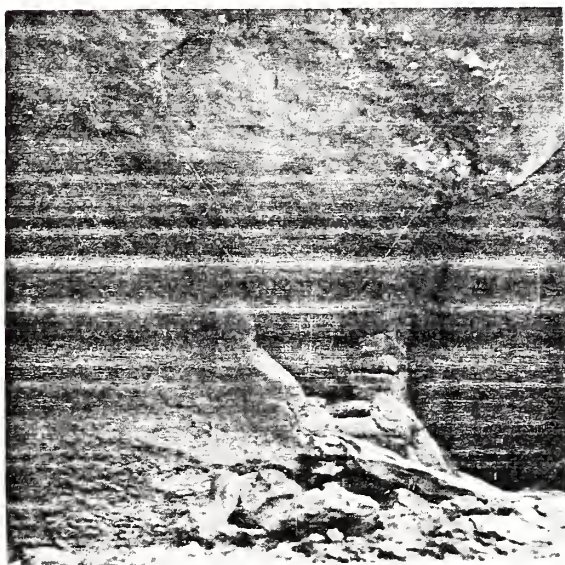
Figure 9 -- Sketch Map of Sites AZ:B:14:13 and 14



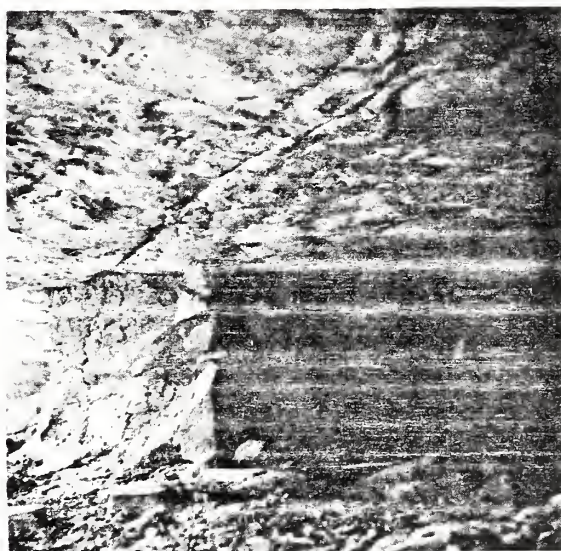
a



b



c



d

Figure 10 -- a. Cliff ledge granaries at AZ:B:14:14. b. Closeup of Site 14 showing use of vertical slabs. c. Granaries at AZ:B:14:16. d. Additional view of Site 16 showing doorway between rooms.

Site No. AZ:B:14:16

This site consists of two well-preserved, coursed masonry, mud plastered granaries (Figures 10, c-d and 11) on a low ledge about 75 meters above the valley floor. The two structures are connected by a doorway (Figure 10, d) containing three stick lintels in mud plaster. A doorway in structure 1 contains plaster remnants but no lintels; however, both contain stone slab sills.

Structure 1.

Measurements: 1.2 meters east-west
1.2 meters north-south
Entryway measures 38 by 54 centimeters
with a 23-centimeter wide sill.

Structure 2. This structure contained 13 corn cobs which were analyzed by Winter.

Measurements: 1.9 meters east-west
2.1 meters north-south
The entryway between this room and structure 1
measures 37 by 41 centimeters with a 33-cm wide
slab sill.

Site No. AZ:B:14:17

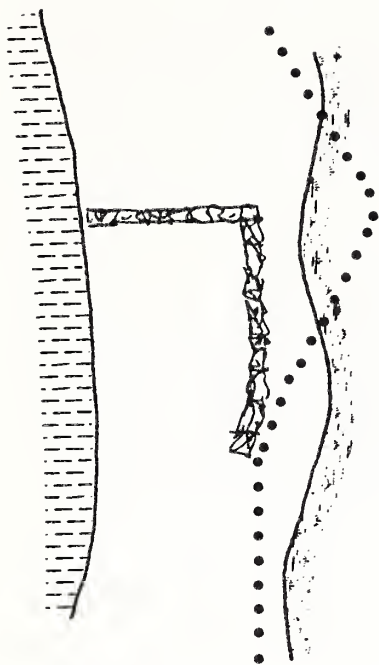
This site consists of two hearths (Figures 12 and 13, a) eroding out of a cut bank on the south side of the canyon. The hearths were constructed at some undeterminable time in the past, then silted over and recently exposed by erosion. Samples collected for pollen analysis had too few spores to be worth counting (Schoenwetter, Personal Communication). Charcoal and a deer mandible were collected. The site is in the canyon floor proper but under a high overhang. We assume the fire-pits were made during a time when the present stream course was not cutting into the silt in the overhang as it is currently doing.

Site No. AZ:B:14:18

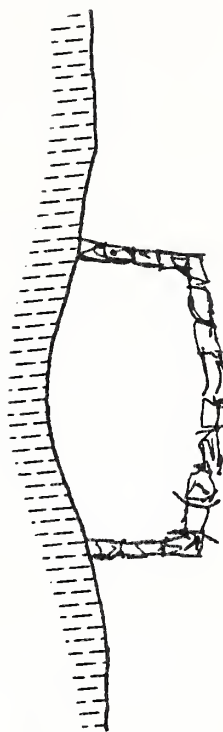
This site has two loci located on the west side of the canyon.

Locus 1. A single granary (Figure 11) about 30 meters above the canyon floor on a ledge. The door is intact (Figure 13, b). The structure consists of coursed masonry sandstone slabs with one large, upright slab. A few sherds and lithics were collected along with one corn cob from the interior of the structure. The interior fill is undisturbed. The door lintel is stone rather than a wooded stick.

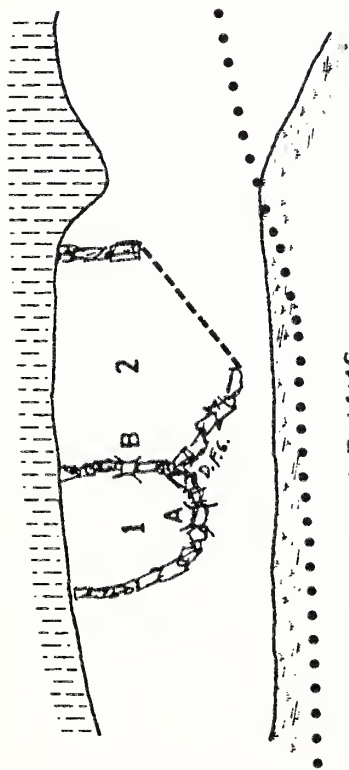
Measurements: 1.67 meters east-west
2.85 meters north-south



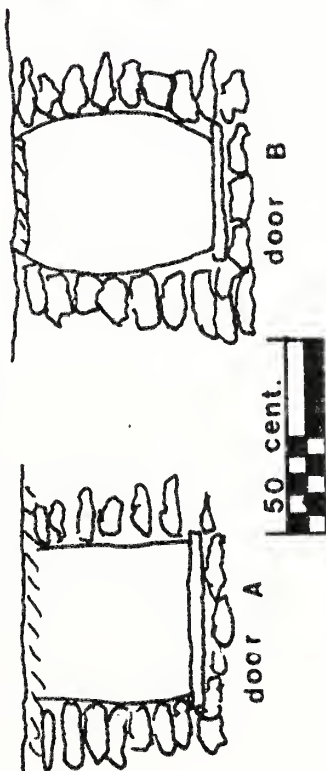
AZ:B:14:15



AZ:B:14:18



AZ:B:14:16



AZ:B:14:22

Figure 11 -- Sketch Map of Sites AZ:B:14:15, 16, 18 and 22.

Locus 2. Habitation structure about 100 meters upstream from locus 1. Badly eroded with part of a single wall remaining on the south side. A complete chert blade (Figure 15, a) was found just north of the structure. About 1 meter of wall remains, but no other measurements were possible. Ceramics and lithics collected from this locus with several sherds scattered down the talus in front of the site.

Site No. AZ:B:14:19

This site is located on top of a small Supai butte midway between a spring and a trail. The butte protrudes above the terrace on the toe of the talus formed by the upper formations and near the cliff edge. It is about 60 meters above the canyon floor and cannot be reached from directly below. To get to the site, we followed a horse trail up to a spring and then through a little saddle to the site. The trail may date to aboriginal times since it is the only good route from the site to the spring and there is no other water near. The spring is running, but the water had been fouled by Havasupai horses.

Structures. On top of the bedrock is a circular structure. Only half remains with a diameter of 4.12 meters. The stones are large, the biggest being 92 centimeters in diameter and 30 cm thick. There is no mortar in this exposed area, but some courses remain 4 rocks high.

Access to the area is barred by a masonry wall with an entry door on the only approach to the top. There is a commanding view both up and down the canyon. It looks either very "fortlike" or ceremonial. Two projectile points were collected.

On the first ledge below the top and on the northeast corner is a living room. The room measures 3.89 meters north-south by 2.70 meters east-west. It is of coursed masonry with 11 courses .69 meters high remaining. Part of the front wall has been washed away. Around the corner to the north are two granaries. They are badly eroded, and measurements were difficult to take. However, they are approximately 4 x 2 meters, the long measurement going with the ledge. In the upstream room, part of a worn cobble was discovered.

Retaining Wall. This wall runs on the south side of the bedrock outcrop. It has a door near the center and is two courses wide. There is no mortar remaining in this exposed area. The stone consists of both thin slabs and larger rock all unshaped.

Measurements beginning at the west end: 5.30 meters; doorway
.64 meters wide; east portion of wall 4.21 meters.
Heights: East wall 1.27 meters
West wall 1.04 meters
Widths: East wall .52 meters
West wall .57 meters

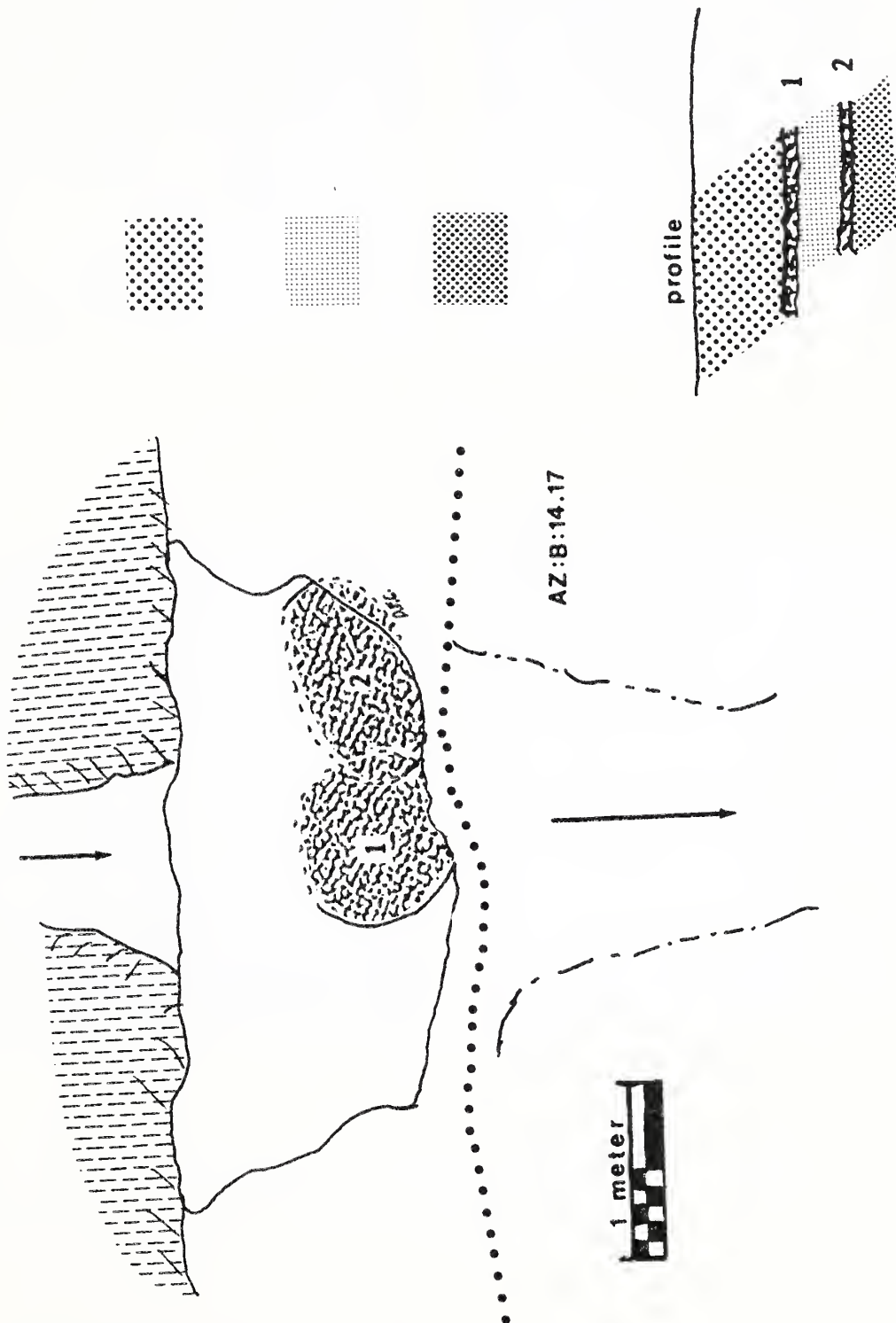
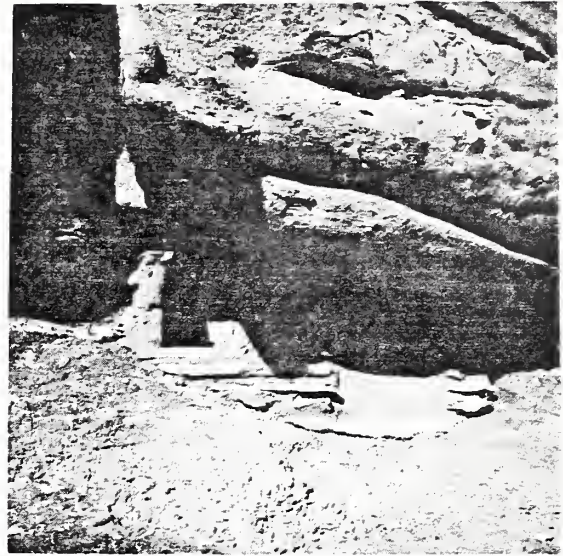


Figure 12 -- Sketch Map of Site AZ:B:14:17.



a



b



c



d

Figure 13 -- a. Buried hearth at Site AZ:B:14:17. b. Granaries at Site AZ:B:14:18. c. Ranger Sam Wolfskill with human size petroglyph at Site AZ:B:14:31. d. Pictograph at Site AZ:B:14:13.

Site No. AZ:B:14:20

There is a large pictograph panel on the south canyon wall. A number of figures (50+) including various geometric designs, human and animal figures, hand silhouettes, snakes, etc., are represented on the panel.

Site No. AZ:B:14:21

Two small granaries are located next to the cliff on a small ledge at the canyon floor, south side just below site 20. Both are mostly destroyed as horses have easy access. There is a lizard (frog?) pictograph in white just above the upstream structure.

Structure 1.

Measurements: 1.21 meters north-south
? meters east-west

Structure 2.

Measurements: 3.10 meters north-south
? meters east-west

Site No. AZ:B:14:22

This is a two-room granary (Figure 11) in a small cirque on the south canyon wall.

Structure 1.

Measurements: 1.91 meters north-south
1.70 meters east-west

Structure 2

Measurements: 2.00 meters north-south
1.41 meters east-west

Site No. AZ:B:14:23

Pictograph panel on first ledge above stream and just below site 19, done in white paint. There are handprints and geometric forms, including a spiral and a snake.

Site No. AZ:B:14:24

At least four structures on first ledge above wash on north wall across from site 23. Not visited.

Site No. AZ:B:14:25

A single human pictograph in white paint on a surface right next to the canyon floor, south side.

Site No. AZ:B:14:26

White pictograph panel on first ledge above canyon floor on south side. Five figures, including snake, lizard, and three geometrics. Also notices handprints and a circle all in white paint on a lower panel. Part of this lower panel appears to be broken. Possible small room under talus.

Site No. AZ:B:14:27

On the south side of the canyon is a petroglyph panel of light scratching. Includes locomotive with cars and tender, and horse with saddle. Two trains, both steam locomotives, old 1800's style. One with flared stack and both with cow catchers. Havasupai.

Site No. AZ:B:14:28

Pictograph panel downstream from site 27 and on south wall.

Date: 8/22/38

Name: Li Sinyella

Seven horses possibly with saddle

Train - Locomotive only with cow catchers and straight stack, scratched--Havasupai.

Site No. AZ:B:14:29

Located on the south wall of the canyon this panel includes both pictographs and petroglyphs. Lizard figures, scratched geometrics. Modern Havasupai camp at this site with cups, canned goods, fry pan, and cooking utensils.

Site No. AZ:B:14:30

Intact granary on second ledge above canyon north wall. Appears to be inaccessible, or at least climbing gear is needed. Door is visible. Site is at least 30 meters above canyon floor and appears very well preserved.

Site No. AZ:B:14:31

Full-size "Kachina" petroglyph (Figure 13, c), 1.72 meters high and .84 meters wide between the upraised arms. There is a small animal figure near the waist. The human figure has a string kilt and a double row of beads across the chest from right to left. The head has four horns, two on top and two are on either side. Perhaps some people returning from a Hopi dance pecked it although it looks earlier than the Havasupai drawings we have recorded.

Site No. AZ:B:14:32

Located a few meters downstream from site 31. A pictograph panel on second ledge above canyon floor done in white paint, includes human and animal figures. There are two different loci, one of which is not accessible. It was photographed by Euler with telephoto lens. Two of the human figures have fingers and toes appended to their limbs.

During the survey, sherds and other surficial artifacts were collected judgmentally, either from the entire site or, in the case of larger manifestations, from series of loci throughout the site.

After cleaning, a fresh break was made on each sherd and an examination was done with the aid of a 10-X hand lens. Identification of types was based primarily on descriptions published in the Museum of Northern Arizona Cermaic Series No. 3 (Colton 1955, 1956, 1958; Dobyns and Euler 1958).

Of the 26 sites recorded during the survey, nine contained ceramic evidence. A total of 334 sherds were collected. As can readily be seen on the accompanying ceramic analysis chart (Table 1), the majority of sherds at each site consisted of San Francisco Mountain Gray Ware indigenous to the Cohonina cultural tradition. Some 66.5% of all sherds belong in this ware. Each recorded sherd assemblage indicates a similar pattern. The three types present within this ware have been elsewhere correlated with tree-ring dates as follows:

- Deadmans Gray: range from A.D. 775-1200; most abundant between A.D. 850-1150.
- Deadmans Fugitive Red: range from A.D. 775-1150; most abundant between A.D. 850-1150.
- Deadmans Black-on-Gray: range from A.D. 900-1115+; best dated between A.D. 960-1100 (Breternitz 1966:73).

Intrusive, or trade sherds are all types from the Kayenta Anasazi to the east. These include 11.7% Tusayan White Ware with four types recorded; Black Mesa B/W, Flagstaff B/W, Sosi B/W, and Dogoszhi B/W; 7.5% Tusayan Gray Ware with two types: Moenkopi Corrugated and Tusayan Corrugated; 6.3% Tsegi Orange Ware with two types: Tusayan B/R and Tusayan Polychrome; and San Juan Red Ware, 1.2% with one type, Deadmans B/R.

At this point, it should be noted that the sherd analysis was done by Euler and his bias in ceramic typology should be recorded. He does not recognize Middleton B/R, preferring to combine it with Deadmans B/R. He also combines Medicine B/R with Tusayan B/R; and Cameron Polychrome and Citadel Polychrome with Tusayan Polychrome.

Tree-ring associated dates for these Kayenta types are as follows:

- Deadmans B/R: best dated between A.D. 775-1066.
- Tusayan B/R: most abundant between A.D. 1050-1150.
- Tusayan Poly: best dated between A.D. 1075-1280.
- Black Mesa B/W: best dated between A.D. 875-1130.
- Flagstaff B/W: most abundant between A.D. 1100-1200.
- Sosi B/W: best dated between A.D. 1075-1200.
- Dogoszhi B/W: best dated between A.D. 1085-1200.
- Moenkopi Corrugated: best dated between A.D. 1080-1200.
- Tusayan Corrugated: most abundant between A.D. 1050-1150 (Breternitz 1966: 70, 73, 74, 75, 86, 96, 100, 99).

TABLE I - CERAMIC ANALYSIS CHART

SITES - ARIZONA NAMES & TYPES	B:14:7		B:14:7		B:14:7		B:14:8		B:14:8		B:14:8		B:14:8		B:14:9		B:14:9	
	Locus 1		Locus 2		Locus 3		Locus 1		Locus 2		Locus 3		Locus 4		Locus 1		Locus 2	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Tusayan White Ware			1	3.0			1	4.2			1	7.7						
Black Mesa B/W			2	6.0														
Flagstaff B/W			1	3.0			2	8.4			6	46.1						
Sosi B/W																	1	7.7
Degoszhi B/W																		
Tusayan Gray Ware							1	4.2										
Moenkopi Corrug.			1	3.0	1	20.0	2	8.4			4	30.8						
Tusayan Corrug.																		
Tsagi Orange Ware	1	14.3	1	3.0			1	4.2										
Tusayan B/R	1	14.3	1	3.0	1	20.0	2	8.4										
Tusayan Poly.			2	6.0														
San Juan Red Ware																		
Deadmans B/R																		
Tizon Brown Ware																		
Aquarius Br.			1	3.0														
Tizon Wiped			1	3.0													1	7.7
San Francisco Mtn. Gray Ware																		
Deadmans Gray	5	71.4	22	66.6	3	60.0	14	58.3	3	100.0	2	15.4	1	100.0	1	100.0	9	69.2
Deadmans Fugitive Red																		
Deadmans B/G																		
Miscellaneous																		
China																		
Unidentified																	2	15.4
Total	7		33		5		24		3		13		1		1		13	

TABLE I - CERAMIC ANALYSIS CHART (CONT'D)

SITES - ARIZONA WARES & TYPES	B:14:9		B:14:10		B:14:11		B:14:12		B:14:12		B:14:13		B:14:18	
	Locus 3		Entire Site		Entire Site		Locus 1		Locus 2 & 3		Entire Site		Locus 1	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Tusayan White Ware	2	7.7							1	2.2				
Black Mesa B/W														
Flagstaff B/W	2	7.7												
Sosi B/W														
Degoszhi B/W									2	4.4				
Tusayan Gray Ware					1	14.3								
Moenkopi Corrug.	2	7.7									1	3.3		
Tusayan Corrug.	3	11.5	2	15.4										
Tsegi Orange Ware									1	2.2	1	3.3		
Tusayan B/R									1	2.2	1	3.3		
Tusayan Poly.									1	2.2				
San Juan Red Ware														
Deadmans B/R														
Tizon Brown Ware					1	14.3			9	20.0	1	3.3		
Aquarius Br.														
Tizon Wiped											4	13.3		
San Francisco Mtn. Gray Ware														
Deadmans Gray	14	53.8	10	76.9	5	71.4	5	83.3	29	64.4	19	63.3	1	100.0
Deadmans Fugitive Red	1	3.8												
Deadmans B/G	1	3.8	1	7.7							2	6.6		
Miscellaneous														
China											1	3.3		
Unidentified	1	3.8						1	16.7					
Total	26		13		7		6		45		30		1	

TABLE I - CERAMIC ANALYSIS CHART

SITES - ARIZONA WARES & TYPES	B:14:18		B:14:19		Total	%
	Locus 2		Entire Site			
	No.	%	No.	%		
Tusayan White Ware			7	10.9	13	3.9
Black Mesa B/W					2	0.6
Flagstaff B/W			5	7.8	16	4.8
Sosi B/W	3	7.1			4	1.2
Degoszhi B/W	2	4.8			4	1.2
Tusayan Gray Ware			2	3.1	4	1.2
Moenkopi Corrug.			4	6.2	15	4.5
Tusayan Corrug.			1	1.6	6	1.8
Tsegi Orange Ware	2	4.8			7	2.1
Tusayan B/R	4	9.5			11	3.3
Tusayan Poly.					3	0.9
San Juan Red Ware	3	7.1			3	0.9
Deadmans B/R					1	0.3
Tizon Brown Ware					11	3.3
Aquarius Br.					1	0.3
Tizon Wiped					6	1.8
San Francisco Mtn. Gray Ware						
Deadmans Gray	26	61.9	43	67.1	212	63.5
Deadmans Fugitive Red	1	2.4			2	0.6
Deadmans B/G	1	2.4	2	3.1	8	2.4
Miscellaneous						
China					1	0.3
Unidentified					4	1.2
Total	42		64		334	100.1

These dates would argue for a general occupation of those sites yielding ceramic evidence by the Cohonina around A.D. 1100, plus or minus 50 years. Nonceramic correlations, especially in architectural patterns, from non-ceramic yielding sites in the survey would place them in the same general time range; with the exception of a few sites consisting solely of petroglyphic art.

The presence in the sample of 5.4% Tizon Brown Ware sherds must also be accounted for. This includes two types, Aquarius Brown and Tizon Wiped. While neither type has been recovered in association with tree-ring dates, it is recognized that neither was present in the area under consideration prior to the A.D. 1150-1300 period (Euler 1958). Aquarius Brown has been identified as a Walapai type, while Tizon Wiped was manufactured by the Havasupai. Both types were produced until ca. A.D. 1890 (Dobyns and Euler, 1958). Hence, of and by themselves, they cannot be used for specific dating. All one can say is that their presence indicates a minor Havasupai utilization of at least a few of the sites after abandonment by the Cohonina.

LITHICS

A total of 82 lithic specimens were collected from 10 sites during the survey. For analysis purposes they have been broken down into the following categories: cores 4, flakes 63, bifacial retouch 12, maul 1, mano 1, fossil brachiopod 1. (See Figures 14, 15, and 16 for illustrations and Tables 2, 3, and 4 for attribute summaries.) Since the collection is thought to be NOT representative, no statistics have been calculated.

Our lithic collection suffers from the same two problems which have plagued Cohonina research since the tradition was defined by Hargrave (1937); that is, 1) sampling and 2) low quantity. Our specimens are surface samples only and were collected judgmentally with emphasis on chipped stone objects which were thought to be tools.

So far as we are aware no survey within the Cohonina culture area has used other than "grab" or judgmental collection procedures. Only two excavated sites have produced any quantity of chipped stone tools; the Mule Shoe Bend Site excavated by James (1977) and Harbison Cave dug by Jennings (1971). The 27 other Cohonina sites which have been excavated and reported have only averaged 11.9 chipped stone artifacts per site. From the seven sites, in addition to Harbison Cave which Jennings (1971) excavated, 152 chipped stone specimens were recovered. McGregor (1951, 1967) found 106 specimens distributed through 13 sites and 58 specimens distributed through six sites while the Wheats (1954) found 36 specimens at GC505. McGregor (1951, 101) notes that ". . . comparatively large numbers of points and blades were found while making surface surveys." Jennings (1971, Table 3) reports 200 chipped stone artifacts from 51 sites which were surface collected for an average of 3.7 artifacts per site.

Without the benefit of quantitative testing, it appears that one of two conditions may have characterized Cohonina chipped stone utilization: 1) relatively low use compared with other southwestern populations, and 2) a pattern of quantitatively different use between habitation and special activity area. Sample bias is, we believe, affecting the picture at this point and future research may well indicate that the Cohonina patterns of chipped stone tool use were little different from their Anasazi neighbors.

Stylistically, the materials from Middle Havasu do not depart from the Cohonina in general. The above statement is arrived at impressionistically and should be viewed as a proposition which needs testing by applying quantitative techniques. Unfortunately, the sampling bias and a paucity of lithic attribute data in all Cohonina reports, with the exception of Gerstle and Greiser (1977), have prevented any attempt at such analysis. In Tables 2-4, we report the attributes of the various chipped stone tools for the benefit of future workers. The attribute list was devised by Landon D. Smith.

No points of the so called "Cohonina" type are present among our specimens (Figure 14). These long slender triangular points defined by Hargrave (1938) are not "diagnostic" of Cohonina culture as one supposed. Rather the wide variability in point types has come to be expected. (See especially Gerstle and Greiser 1977, Figures 9-12; Jennings 1971, Figures 24, 25; Johnson and Hewitt 1977, Plates 19-22; McGregor 1951, Figure 33, 1976, Figure 26; and Wheat and Wheat 1954, Figure 117.) Our points from Middle Havasu show the same variability, Figure 14.

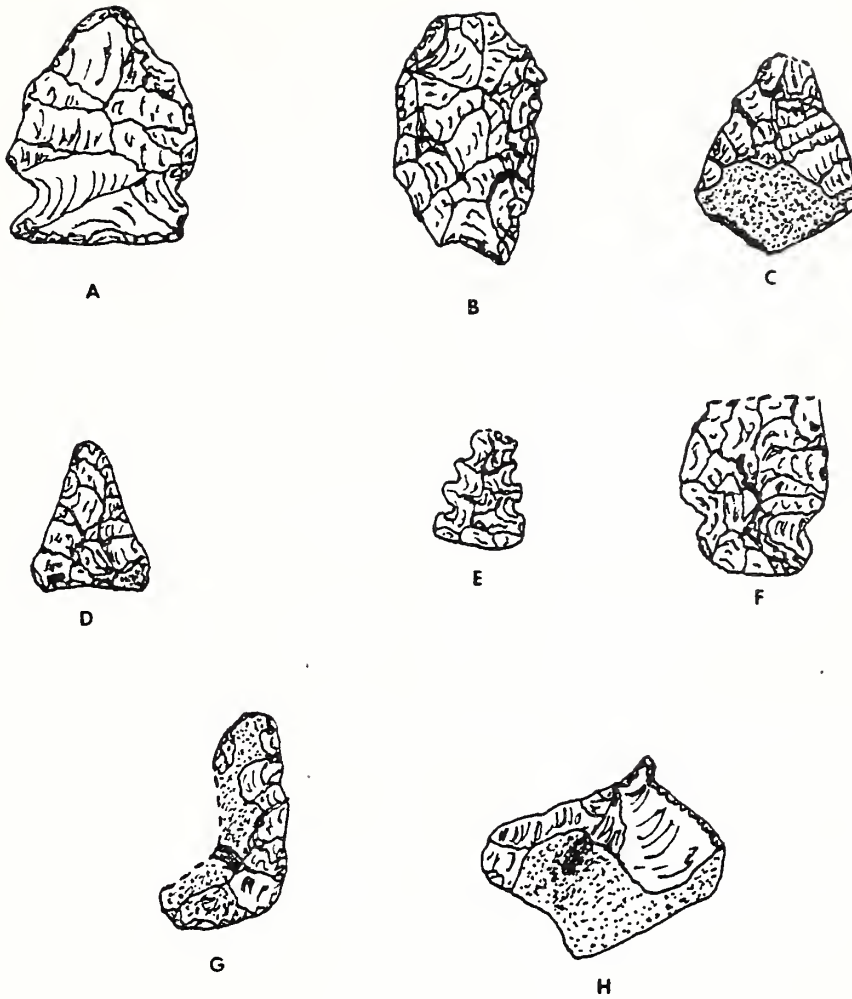


Figure 14 -- Projectile points from Havasu Canyon: A and F, Site 19; B, C, and G, Site 13; D, Site 12; E, Site 9; H, a graver from Site 7, all drawn actual size.

TABLE 2 TOOLS WITH BIFACIAL RETOUCH

	Max. Length	Max. Width	Max. Thickness	Notes	Wt.	Material
Projectiles						
19.8	3.05	2.45	0.55	Width Between Notches 1.80 Width of Stem 2.35 Max. Depth of Notching .4 Basal Retouch	4.3	Flint
19.7	2.30	1.95	0.55	Tip Broken Width Between Notches 1.40 Width of Stem 1.60 Max. Depth of Notching .40 No Basal Retouch	3.4	Chalcedony
13-8	3.25	1.85	0.60	Tip Broken, Basal Notch .20 deep	3.6	Flint
13-7	2.50	2.10	0.40	Some Cortex, Tip Broken No Notches	1.6	Flint
12-2	1.95	1.50	0.40	No Notching	.9	Obsidian
9-5	1.45	1.2	0.45	Tip Broken, 3 sets of Notches up Lateral Sides Giving a Serrated Edge. Tip Broken at 4th & Probably Last Notch Set.	.4	Obsidian
13.9	2.65	1.70	0.45	Broken in Manufacturing Process Tip not Finished	1.3	Obsidian
Knives						
18-5	7.50	3.60	0.90	Ondulations Present Thinning Flake Scores Removed Most of Bulb and Most of Cortex on Dorsal Face	26.9	Chalcedony
17-2	6.40	3.10	0.55	Large Basal Thinning Flake Scar. Retouch Over all Edges	13.8	Basalt
8-4	4.25	3.00	0.70	Broken Horizontally Retouch on All Edges	10.0	Chalcedony
Saw						
13-5	4.80	1.60	0.45	Does not have Bifacial Retouch Prominent Serration on Both Lateral Edges	3.9	Basalt
Graver						
7-6	3.00	2.70	0.40	Graver Point 3m in Length Made on a Lateral Edge of a Flake, Flake has Ondulations	2.4	Obsidian

TABLE 3-- FLAKE MORPHOLOGY

TABLE 3 - FLAKE PROPERTIES																															
Flake Identification				Undulations			Presence of Cortex			Platform Preparation			Flake Dimensions			Platform Dimensions			Thickness		Edge Quality			Comments							
Raw Material	Feather	Hinge	Step	Pervase	Bifacial Flaking or Percussion	Lipding	Fissure	Absent	Observable	Pronounced	Erattures	Platform	Partial Dorsal	Total Dorsal	Abrasion	Crushed	Max Length	Max Width	Ratio LxW	Max Length	Max Width	Ratio LxW	Bulb	Below Bulb	Weight (Grams)	Retouch	Wear	Pronounced	Conchoidal	Natural Fracture	
7-1	Chalcedony	X						X			1						2.1	2.35		.2			.35	.1	1.5	X	X	X	X		Attrition
7-2	Chert	X				X	X	X			2		X				4.1	3.6		1.1			1.45	1.25	2.30	X	X	X	X		Attrition
7-3	Chert	Broken				X		X			4	X	X				3.6	3.65	2.3	.95			.9		20.1			X			Lower End Broken
7-5	Dorsal Blk. Brown	X				X		X			3		X				1.5	1.6	.85	.25			.35	.15	.6	X	X	X			Attrition
7-6	Chert	Broken						X			5	X	X				2.35	3.00	.6	.3			.65	.1	3.9	X	X	X			Attrition
7-11	Quartzite	X						X			5						5.1	2.45	.85	.25			.65	.35	7.5	X	X	X			Attrition
8-1	Chalcedony	X				X		X			7						6.45	4.65	3.0	.7			1.8	1.6	70.5	X					Attrition Bulb Detached
8-3	Chert	X				X	X	X			3		X				4.0	4.1						.8	16.9	X					Attrition
8-5	Chalcedony	X				X		X			2			X			3.5	2.8	2.25	.7			1.0	4.5	0.8	X	X				Attrition
9-1	Chert	X						X			2						6.85	4.4					1.15	1.05	34.8	X	X	X			Attrition
9-2	Chert	X									1					X	1.85	4.15	.6	.2			.4	.5	3.9	X	X	X			Attrition
9-3	Chert	Broken				X		X			2		X				3.6	5.6	3.3	.9			.8	.6	21.2	X	X	X			Attrition
9-6	Chalcedony	X				X		X			3		X				4.8	2.35		.3			.65	.35	7.9	X	X	X			Attrition
9-10	Chert	X				X		X			3		X				3.6	2.45	1.95	.7			.8	.35	5.7	X	X	X			Attrition
9-11	Quartzite	Retouched							X					X			5.05	4.95		.25			.7	.5	25.4	X		X			Unifacial Retouched
10-1	Chert	X				X		X			3						5.3	6.6	.85	1.7			2.3	.3	44.9	X	X	X			Attrition
10-2	Chalcedony	X				X		X			4		X				4.45	6.6	2.65	1.15			1.4	.45	30.9	X	X	X			Attrition
10-3	Chert	X									1	X	X				6.2	2.9		1.5	.8		.85	.45	17.1			X			Attrition

TABLE 3 - FLAKE CHARACTERISTICS (CONT'D)

Flake Description	Flake Formations				Bifacial Flaking	Percussion	Looting	Ondulations			Presence of Cortex			Platform Dimensions			Platform Dimensions			Thickness	Weight (Grams)	Retouch	Heur	Platform Quality		Comment				
	Feather	Hinge	Seed	Reverse				Asent	Observable	Pronounced	Erallures of Dorsal Scars	Platform	Partial Dorsal	Total Dorsal	Crushed	Abrasion	Max Length	Max Width	Ratio LxM					Max Length	Max Width		Ratio LxM	Bulb	Below Bulb	
10-4	Chert	X							X			2						3.0	4.15	2.75	1.7	1.7	.25	23.8		X	X	Conchoidal	Attrition	
10-1	Chert	X					X			X		4						2.5	3.0	2.05	.7	1.0	.2	10.6		X	X	Conchoidal	Attrition	
10-8	Chert		Broken							X		4	X	X				2.05	2.95	.4	.35	.9	.5	4.9		X	X	Conchoidal	Attrition of Platform Removed	
10-10	Obsidian	X					X					5						2.0	.85		.15	.2	.1	.1		X	X	Conchoidal	Attrition	
10-10	Obsidian		X						X			11						1.3	1.8				.3	.6		X	X	Conchoidal	Attrition	
10-11	Chert	X					X			X		2		X				4.1	3.0	3.25	.3	1.45	.45	24.6	X		X	Conchoidal	Attrition of Platform Removed Bulb	
10-12	Chert		Retouched				X			X		4		X				6.35	4.55	1.41	.45	2.15	1.7	80.5	X		X	Conchoidal	Unifacial	
10-13	Quartzite	X					X			X		3		X				2.0	5.2	2.01	.05	1.3	.95	57.8		X	X	Conchoidal	Attrition	
11-1	Quartzite	X					X			X		2		X				6.1	5.3	2.75	.8	1.6	1.5	63.4	X				Conchoidal	Bifacial
11-2	Quartzite	X					X		X	X			3					5.0	4.0	1.6	.7	1.75	.5	32.3					Conchoidal	Unifacial Bulb Removed
11-3	Obsidian		Broken					X	X			2		X				1.9	2.0				.65	2.1	X				Conchoidal	Attrition
12-1	Chert	X				X				X		2						3.05	3.1	1.5	.6	.65	.25	6.0		X			Conchoidal	Attrition
12-2	Chert		Retouched						X			8						4.65	5.15	1.15	.30	1.20	.35	13.2					Conchoidal	Attrition
12-3	Chert	X							X		X	5						5.2	3.8	1.5	.45	.45	.35	13.2		X			Conchoidal	Attrition
12-4	Chert	X					X		X		X	2		X				3.3	2.09	.6	1.0	1.3	.55	12.8		X			Conchoidal	Attrition
12-5	Basalt	X										5						1.75	2.15				.3	1.8	X				Conchoidal	Broken Bulb Pressure
12-7	Chert	X										1		X				3.7	3.5		.30	1.2	.3	10.6	X				Conchoidal	Platform Removed
12-8	Chert	X										1						5.65	4.9	2.25	.25	.85	.5	2.6		X			Conchoidal	Attrition

TABLE 3 - FLAKE FABRIC DATA (CONT'D)

ID Number		Flake Forming			Bipolar Flaking	Lipoid	Fissure	Undulations			Presence of Cortex			Platform Preparation		Flake Dimensions			Platform Dimensions			Thickness		Weight (Grams)	Retouch	Wear	Flaking Quality		Comments	
		Feather	Hinge	Step				Perverse	Absent	Observable	Pronounced	Platform	Partial Dorsal	Total Dorsal	Abrasion	Crushed	Max Length	Max Width	Ratio LxW	Bulb	Below Bulb									
13-1	Chalcedony	X				X										3.4	2.1	2.0	0.9	1.15	1.0	9.3		X		X	Conchoidal	Natural Fracture	Attrition	
13-2	Chalcedony	X				X										3.2	3.9	0.55	0.30	.45	.6	5.8		X		X	Conchoidal	Attrition	Bulb Absent Unifacial	
13-3	Basalt		Broken									6+				4.0	1.7					6.2	X			X			Attrition	
13-4	Basalt		Broken					X				X				2.9	3.2	0.4	0.15	.5	.4	5.2				X			Attrition	
13-6	Basalt	X						X				X	6	X		4.5	4.7	4.0	.75	.7	.5	12.8		X		X			Attrition	
13-10	Chalcedony	X						X				1				2.1	3.75	1.6	0.35	.6	.3	4.9				X			Attrition	
13-11	Obsidian	X						X			X	5		X		4.0	3.2	1.6	.7	0.6	6.0		X		X				Attrition	
13-12	Basalt		X					X			X	4				2.4	3.6	0.45	0.30	.4	.4	3.9		X		X			Attrition	
13-13	Chert	X						X			X	4		X		4.3	5.5	3.1	1.8	1.3	.7	25.6		X					Attrition Broken Unifacial	
18-1	Chalcedony	X										4				3.3	2.15					9.2	X			X			Attrition Unifacial	Removed Part of Platform
18-2	Basalt	X						X			X	6			X	3.55	1.95	.4	.1	.2	.2	1.7		X		X			Attrition Unifacial	
18-3	Basalt	X										5				2.55	4.15	.45	.25	.3	.15	5.5		X					Unifacial	
18-4	Chalcedony	X						X			X	4				3.5	3.2	2.0	.95	.6	.5	9.0	X			X			Unifacial	
18-6	Basalt	X						X				4				2.45	2.3					2.4							Broken	
18-7	Basalt	X										6				3.1	3.2	1.15	.25	.25	.2	2.5		X		X			Attrition	
18-8	Chert	X						X				5		X		7.55	4.0	1.3	.7	.85	1.0	42.0		X		X			Attrition	
18-9	Chert		X					X				5		X		2.5	1.85	.8	.25	.35	.20	1.1		X		X			Attrition	
19-2	Chert	X										5				4.50	2.25	.8		.55	.9	10.1		X		X			Attrition	

TABLE 3 - LAKI (CONT'D)

ID Number	Flake Termination				Bipolar Flaking	Percussion	Lipoino	Fissure	Ondulations			Erratillures	Dorsal = or Flake Scars	Presence of Cortex			Platform Preparation	Flake Dimensions			Platform Dimensions			Thickness		Weight (Grams)	Retouch	Wear	Pronounced Conchoidal	Conchoidal	Flaking Quality	Comments
	Feather	Hinge	Step	Perverse					Absent	Observable	Pronounced			Platform	Partial Dorsal	Total Dorsal		Abrasion	Crushed	Max Length	Max Width	Ratio LXM	Max Length	Max Width	Ratio LXM							
19-3	Chalcedony	X						X	X			2		X				2.45	3.3	2.0	.9	.95	.4	4.9		X	X				Natural Fracture	Attrition Pronounced
19-4	Chert	X							X			4						4.5	2.3	1.5	.4	.3	.4	4.0		X	X					Attrition
19-5	Chert	X							X			4						5.7	2.0	.5	.25	.30	.45	5.4		X	X					Attrition Blade
19-6	Basalt	X									X							2.7	2.3	1.6	.5	.5	.4	3.1		X	X					Attrition
19-9	Agate	X					X		X			5					X	3.0	2.6	2.0	.6	.7	.5	5.9		X	X					Attrition

Table 4 -- Core Morphology

[illegible]

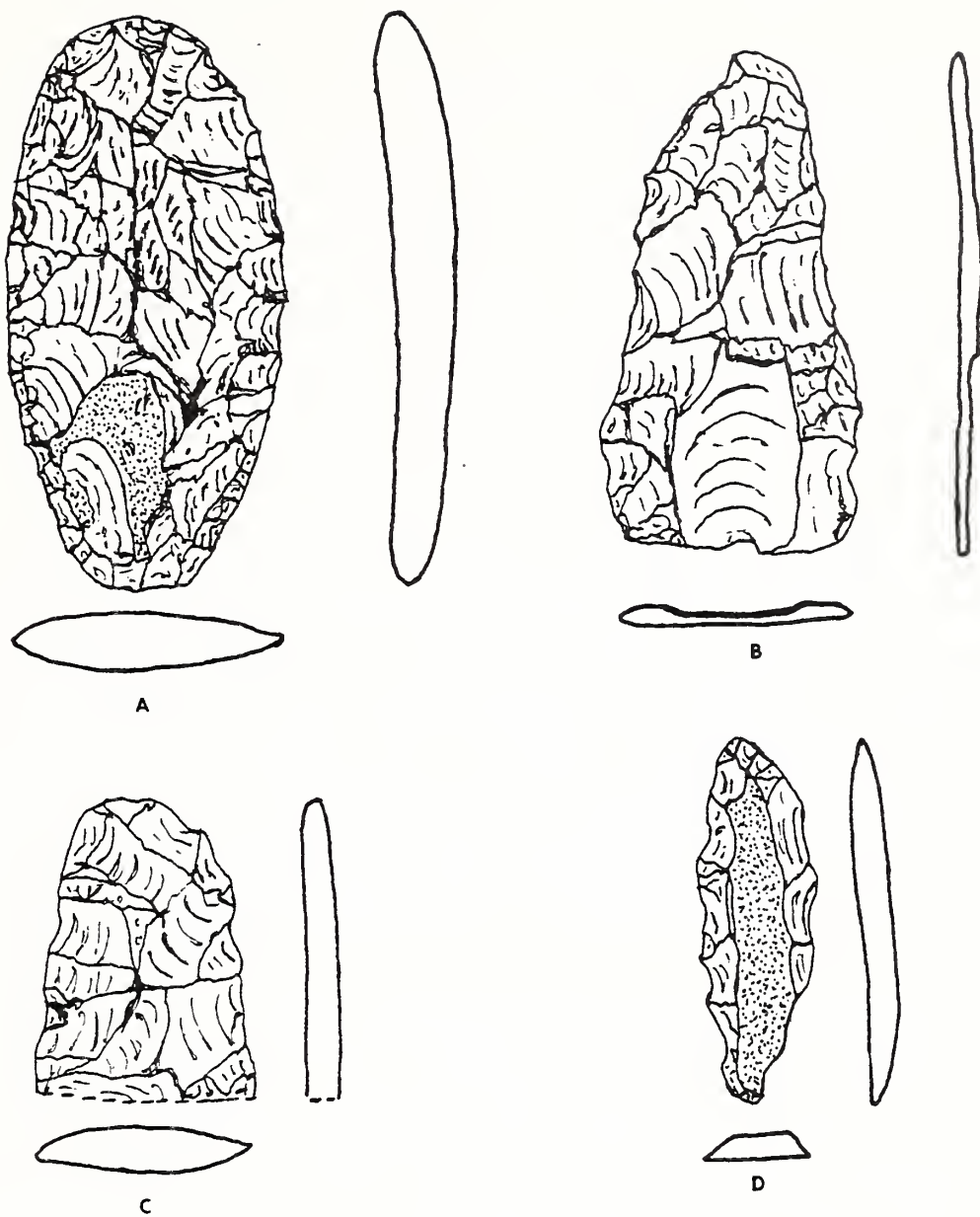


Figure 15 -- Knives and saw from Havasu Canyon: A, Site 18; B, Site 17; C, Site 8; D, Site 13, all drawn actual size.

Neither flakes, cores, nor ground stone showed any distinctive treatment attributes which would set them apart from similar objects in Cohonina sites insofar as we can tell from the published literature.

Table 5 - Lithic Materials

<u>Material</u>	<u>Total Specimens</u>
Agate	1
Basalt	12
Chalcedony	20
Chert	26
Dacite	1
Flint	3
Limestone	2
Obsidian	9
Quartzite	5
Total	<u>79</u>

Table 5 shows the breakdown of lithic materials used. Prehistoric sources for the various rocks could include materials washed into the stream from above. This includes the entire Permian portion of the Grand Canyon stratigraphy which could have been available in varying quantities in gravel bars along the stream much as it is today. Materials could, of course, have been transported from tailings and/or quarry locations by taking advantage of the various trails into the canyon. Survey in the vicinity of the various trails, with quarry sites specifically in mind, might be profitable. At least one piece of obsidian came from the San Francisco Mountains and the remainder probably was taken from the area of Government Mountain or Mt. Floyd to the south. The cherts, flints, and chalcedonies are found in the Kaibab limestone as was the brachiopod. Source of the quartzite is unknown.

Too little attention has been paid to Cohonina lithic materials and their sources. Jennings (1971) and James (1977) both record material types but only James comments on source. McGregor (1951) (1967), recognizes cherts, chalcedonies, obsidian, and fine-grained basalt and notes that for small points, ". . . The most commonly used material is obsidian. . . ." (1967, 93-94). Gerstle and Greiser (1977, 15) provide support for McGregor's notion when they state, ". . . It appears that there is a significant correlation between points and obsidian. The small points have the highest percentage of obsidian. . . ." The only small points from our collections in Middle Havasu (Figure 14 D and E) are obsidian. This is not to suggest that small points are only made of obsidian but rather that there appears to be a behavioral preference that points under 25mm in length be made of obsidian. Since obsidian working edges are brittle (compared to cherts, chalcedonies and basalts), the attrition rate would be higher for comparable uses. Thus, smaller points may be a result of attrition-retouch-attrition cycles or the result of use in which attrition was not a disadvantage.

With an increasing interest among Southwestern archeologists in lithic analysis, we can anticipate that Cohonina lithic data will receive additional attention. This should elucidate both the stylistic qualities which will serve to clarify cultural relationships in time and space as well as functional qualities which will serve to clarify environmental relationships.

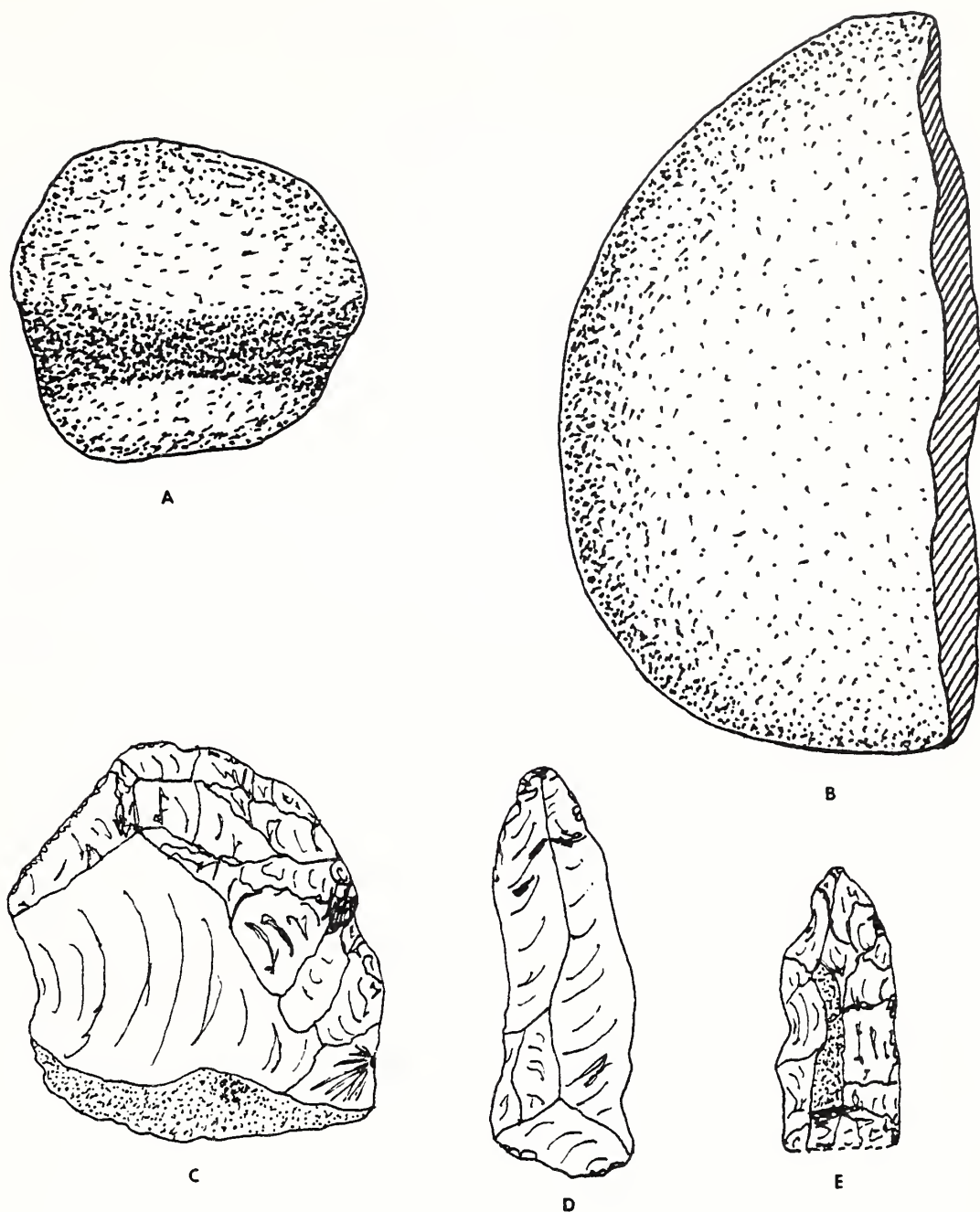


Figure 16 -- Maul, mano and flakes from Havasu Canyon. A, Site 17; B, Site 19; C, Site 12; D, Site 19; E, Site 9, all drawn actual size.

PERISHABLE ARTIFACTS

Worked Wood

A fragmentary stick, 10.3 cm long and 7mm in diameter, probably of willow (Salix sp.), wrapped with five strands of sinew, was recovered from the surface of AZ:B:14:16. Its function is not determinable.

Knot

A single square knot, fashioned from unspun yucca fibers, was collected in locus 3 at AZ:B:14:9.

Sandal

A fragment of the heel of a twined yucca sandal was recovered from locus 2 at site AZ:B:14:7. There are two warps remaining, each is one-ply, S-twist cordage. The weft is crushed yucca, one-ply, S-twist. The specimen is 1.8 cm thick. If comparisons can be made from such a small fragment, this seems similar to Anasazi sandals of a general Developmental Pueblo style.

NONARTIFACTUAL MATERIALS

Mineral

A small, discoidal, unmodified limestone concretion, 1.4 cm in diameter, stained with iron, came from the surface of AZ:B:14:19.

Animal

Only one animal bone was noted in the sites. A fragmentary right mandible of a pronghorn (Antilocapra americana) came from the surface of AZ:B:14:17.

Vegetal

A fragmentary yucca "quid" was collected from locus 3, AZ:B:14:9. Several gourd rinds were recovered from two sites. At AZ:B:14:7 in locus 2, were 10 fragments of Cucurbita sp. In a habitation room (locus 2) at AZ:B:14:9 were two fragments of Cucurbita mixta and one of Cucurbita sp.

CORN

by Joseph C. Winter

Thirty-six dried corn cobs and numerous cob fragments from six sites in Havasu Canyon were analyzed for data on morphology and relations with nearby prehistoric and historic maize. The sample is too small to allow a valid statistical study since no site yielded more than 13 cobs (Table 6); but it does permit tentative inferences concerning the local maize distributional patterns. The collection is also significant in that it may represent a late prehistoric Cohonina or early historic Havasupai collection.

Morphology and Relations

Very little is known about the prehistoric maize of the local Anasazi and Upland Yuman peoples. Several prehistoric Anasazi collections from Nankoweap Canyon and the Grand Canyon near Supai have been studied by Cutler (1963); while a sample, with an estimated date of A.D. 1275-1300, from much farther to the west in Lower Grand Canyon was analyzed by Cutler and Bower (1961). Both samples are very high in percentages of 8-rowed cobs (Table 7) and probably reflect late Pueblo II-Pueblo III period contexts. Several collections of historic Havasupai and Mohave-Yuma maize have also been analyzed, but the statistical data is similarly scanty. Carter and Anderson's (1945) investigation of a small collection of Havasupai maize indicated that it averages 12 rows of kernels, with relatively low numbers of 8-rowed cobs, and thus appears intermediate between Hopi maize with its even lower numbers of 8-rowed cobs and Mohave-Yuma corn with its much higher numbers of 8-rowed specimens. Similar studies by Carter (1945) and Cutler (1956) with Mohave maize have also shown that corn along the lower Colorado has high numbers of 8-rowed cobs, but no other studies have been run on Havasupai and Walapai maize. Most of the Havasupai types of corn were probably derived from the Hopi, while Walapai maize represents a blend of Havasupai and Mohave influences. Two probable Hopi types were grown by the Havasupai, and at least seven Mohave types were obtained relatively recently from the Walapai (Spier 1928). Relations with the Hopi have always been close, Whiting (1939), for example, noted four Havasupai maize varieties in the Hopi villages, two of which were originally obtained from the Hopi. Drucker's (1941) Walapai informant stated that one type of corn had been obtained from the Mohave, while four more recent types were derived from the Havasupai. Gifford (1940) spotted six types of Walapai corn, while Kroeber (1935) stated that the Walapai were raising three Havasupai types. Corn thus seems to have traveled up and down the river, originating with Pueblo groups on the one hand and passing through the Havasupai to the Walapai, and originating with the Mohave on the other and passing through the Walapai to the Havasupai. Late prehistoric-early historic maize from Havasu Canyon could therefore, reflect this intermediate position between Anasazi and Yuman influences, unless it was deposited in a totally Anasazi context.

The 36 cobs do seem to represent an intermediate Havasupai-like position. The sample is quite small; but, unlike the nearby Anasazi material which Cutler studied from Nankoweap and Grand Canyon, the maize has an average row number that is quite high with relatively low numbers of 8-rowed cobs. This might also represent an early Pueblo II context, yet many of the specimens are robust and well-developed and appear to be late. The sample from AZ:B:14:16 is especially robust and uniform, and may have originated in the same field. All in all, the collection seems to resemble historic Havasupai Types, with its tendency toward high row numbers. This is understandable, considering the geographic proximity of the modern Havasupai; but it might also represent pre-Havasupai Cohonina maize. Schwartz (1966) has suggested that the Cohonina had expanded into Havasu Canyon from the surrounding highlands by A.D. 900, and that by A.D. 1100-1200, they were well established in the canyon environment. If this interpretation is correct, and the cob measurements seem to support it, the maize from the six sites in Havasu Canyon may well represent a late-Cohonina or early-Havasupai collection.

TABLE 6 - HAVASU CANYON MAIZE DATA

Site	#cobs	Mean row number	% cobs/row				14	Mean cob diameter(mm)	Mean rachis diameter(mm)	Cob/rachis index	Mean cupule width(mm)	Mean lower glume width(mm)
B:14:7	6	10	0	16	50	33	0	16	7	2.2	7.8	4
B:14:8	3	10.6	0	33	0	66	0	18.5	10	1.8	9	4
B:14:9	12	11	0	16	25	50	8	17.7	7.8	2.2	7.7	4.3
B:14:12	1	12	0	0	0	100	0	24	15	1.6	10.5	6
B:14:16	13	11.5	0	15	15	46	23	16	8.6	1.8	8.6	4.8
B:14:18	1	12	0	0	0	100	0	22	14	1.6	6	5
TOTAL	36	11	0	17	22	50	11	17	8.5	2	8.1	4.4

TABLE 7 - COMPARISON OF HAVASU CANYON
MAIZE WITH NEARBY COLLECTIONS

<u>Provenience</u>	<u>Source</u>	<u># cobs</u>	<u>% 8-rowed cobs</u>	<u>Mean row #</u>	<u>Mean cupule width</u>
Havasu Canyon	present study	36	17	11	8.1 mm
"Walapai"	Cutler and Bower 1961	77	28	10.1	7.6
Nankoweap Canyon	Cutler 1963	5	60	9	7.5-9.5
Grand Canyon	Cutler 1963	13	39		7 - 9.2
Havasupai	Carter and Anderson 1945			12	
Hopi	" "			14	
Mohave-Yuma	" "			8 - 10	
Lower Colorado	Carter 1945			10	
Hopi	" "			12	
Hopi	Cutler 1956			12.5	
Mohave	" "			10	

ROCK ART

We have not attempted stylistic or other types of analyses of the pictographs and petroglyphs which were noted during the survey. Ten sites were recorded solely as rock art sites and rock art was observed at an additional five sites which also had structures. Thus, 15 of the 26 recorded sites have rock art. Forms include a wide variety of geometric motifs, various animals, human figures, and historic items including personal names and 1800's style steam locomotives. The most dramatic figure is a life size (Figure 13, c) "Kachina" petroglyph. Green speculated, on its discovery, that it may have been made by Havasupai returning from a Hopi dance. However, Euler has shown a photograph of the glyph to several Hopi and Havasupai informants and none have been able to identify it. Figures 2, c-d; 6, b; 8, c-d; 13, c-d, illustrate, a good cross section of the rock art recorded.

CONCLUSIONS

Johnson and Hewitt (1977, 27) recently have proposed four fundamental research problems for the archeology of the Coconino Plateau including the Havasu Canyon drainage; 1) recovery of cultural data, 2) chronology building and culture history, 3) settlement and subsistence patterns, and 4) relationship between archeological units and ethnic groups. In this chapter we will deal with the contributions of our research in Middle Havasu Canyon to each of the above topics and our views with regard to the research issues involved.

Recovery of Cultural Data

Our data recovery has been at the descriptive rather than the analytical level. We accumulated information on rock art, habitation, storage, food processing, and possibly one ceremonial site. Collections of ceramics, lithics, corn cobs, and a few perishables added to the information base for the canyon. Unfortunatley, we were unable to complete the survey along the east side of the canyon, and the west side was not examined in minute detail. Sites were recorded when observed from the canyon floor and no attempt was made at complete coverage. We were not able to mount subsequent expeditions which might have filled these gaps. The Havasupai Tribe, which now controls the area, is urged to support this additional important scientific investigation. The major problem with the recovery of cultural data in this project is the issue of representativeness. For that portion of the canyon surveyed, our impression is that the data are representative but since no statistical sampling was done this cannot be demonstrated. This problem exists throughout the Cohonina area both in terms of survey and excavation. Only with the ongoing surveys of Effland and Arizona State University on the Tusayan District of the Kaibab National Forest is this problem being overcome for the Cohonina.

Chronology Building and Culture History

Only the ceramics from the survey resulted in any data on chronology. Although Euler did the original analysis, Green examined all the pottery and is in complete agreement that a date of A.D. 1100 \pm 50 years is correct. None of the pollen, tree-rings, or C14 samples taken yielded information. Winter's attempts (this paper) to address chronology through the corn cobs is of little help since he says they may date from either Cohonina or Havasupai times. Thus, based on the ceramics, the sites appear to have been occupied by Cohonina peoples around 1100 A.D., with the obvious exceptions of the historic rock art sites. Ferg (1977:114) has outlined a phase sequence for the Cohonina based on the positions of Schwartz (1965) and Jennings (1971). They are accepted uncritically and we feel the designation are, if not premature, then potentially subject to great revision when solid dating is available for the Cohonina area.

Settlement and Subsistence Patterns

Recovery of the corn cobs is the basic datum relevant to subsistence. The pollen (Schoenwetter, personal communications), unfortunately, was not useful. Arable land for corn farming does exist in the canyon bottom. It is not extensive and is subject to flash flooding which during the heavy summer rainy season may have, from time to time, resulted in crop loss. Our discovery of mescal pits in the survey area (Site 13) suggests the utilization of Agave. One mescal pit was observed on the Esplanade from the helicopter survey. A survey of the Esplanade above our area would no doubt reveal many more such sites given the large numbers found by Euler (1976) during the Esplanade survey around the Great Thumb. The Esplanade is the principal area where Agave is found today. Clearly, excavation is needed in order to recover more subsistence data.

The postulated settlement pattern for Havasu Canyon is summer occupation of the canyon and winter occupation of the rim. This is the traditional ethnographic pattern for the Havasupai (Spier 1928) and Schwartz (1958) proposed that it was similar prehistorically. This pattern was a surprise to Green since elsewhere (in Press) he has suggested the reverse pattern for ledge sites in southeastern Utah. In that area the majority of habitation sites along ledges and in alcoves are located on south or southeast exposures and Green believes these sites were essentially occupied during the winter months. In southeastern Utah most ledge/alcove sites are located within 50 feet of the pinyon-juniper covered rim, thus providing adequate fuel close at hand. In Havasu canyon, however, the rim is about 1680 feet (512 m) above the canyon floor with the expanse of the Esplanade between making the transportation of firewood from the canyon rim to the floor unlikely except for small quantities.

Neither of us would argue that everyone remained on the plateau during the winter and in the canyon during the summer. Nevertheless, a degree of seasonality was probably practiced. The Havasupai viewed the rim as their traditional home when visited by Spier (1928) and the Cohonina may have been essentially rim dwellers with expeditions to the Esplanade and canyon bottom for special exploitative purposes. The above argument is not made to suggest Cohonina-Havasupai continuity but rather as adaptive similarity.

Actually, we believe the Cohonina occupation of the canyon floor to have been short lived. An analysis by Euler of ceramics from Schwartz's (1956) excavations in the vicinity of Supai Village in Havasu Canyon revealed only two Pueblo I and no Pueblo III sherds. Euler's (1976) data from the Esplanade suggest a sparse utilization during the period from 800-950 A.D., emphasizing Agave and other wild plant utilization coupled with some bighorn sheep and deer hunting. This use continued and probably increased during A.D. 950-1050 with the beginnings of storage architecture occurring in the canyon during this period. Between A.D. 1050 and 1150 the major architecture was constructed with numerous storage areas for corn as well as some wild plants. The heavy utilization of the canyon floor during this century was probably prompted by some combination of environmental factors along with the general population increase which is thought to have occurred over much of the Southwest at this time.

The above reconstruction for the occupation of Havasu canyon differs^S markedly from ~~those~~ of Schwartz who states:

~~that~~

Only at this time [i.e., 1100-1300] were cliff dwellings occupied, a fact which perhaps reflects the nature of the period. It seems reasonable to assume that protection was the motive behind these population movements, with the canyon providing the logical defense against intruders (Schwartz 1956, 81).

We find no evidence for occupation of the ledge and alcove sites beyond 1150 at the very latest. The defense hypothesis in the Southwest is old and worn. Euler sees no evidence for overt hostility anywhere in Grand Canyon. We suggest that granaries built along ledges are simply more efficient in terms of energy expended in construction and loss to rodents than other storage forms. A ledge obviously has the roof, floor and backwall already built and these are impregnable to rodents. In Green's opinion there is nothing in Havasu Canyon remotely resembling fortification or protective architecture compared with sites in southeastern Utah, and the ledges themselves do not control access to the sites.

Finally, we are certainly not arguing that all Cohonina peoples were involved in the Canyon-Plateau use pattern here described (see comments below). Cartledge (1978) has produced settlement and site type information for the area around Sitgreaves Mountain which could reflect year-round occupation of that area. We suspect that inventory work currently (1978) underway by Arizona State University and Richard Effland will go a long way in relieving the sampling bias^S which we feel have been the principle contributor to any misunderstanding of Cohonina settlement systems on the plateau.

Archeological-Ethnic Relationships

Schwartz has long and often (1955, 1956a, 1956b, 1957, 1958, 1959, 1966) maintained that the Havasupai are the direct descendants of the Cohonina. Euler (1958, 1963, 1975, 1976, 1977) has just as long and often maintained that they are not. Green came to the project without bias for either point of view. Based on the results of the project, review of the literature, and probing questioning of Euler, Green believes that there is presently no evidence for arguing that the Havasupai are direct descendants either genetically or culturally from the Cohonina. Green accepts Euler's view and we make the following arguments in support of that view.

1. First, and most important, there is simply no evidence for occupation in Havasu canyon between A.D. 1150 and 1300. Indeed, there is no evidence anywhere in Grand Canyon to indicate occupation during that time. Schwartz (1957, 376) states ". . . In the years following A.D. 1100 . . . all of the Coconino Plateau occupants moved into Cataract Creek Canyon, where the farming techniques developed by the handful of inhabitants who lived there since about 900, . . . were used to support the whole tribe as well as certain foreign immigrants. . . ." (emphasis ours). Overlooking the staggering assumptions about population dynamics which one must accept in order to move everyone off the plateau and into the canyon, one wonders where the artifacts produced between 1150 and 1300 went. Conveniently washing them all down the canyon

(Schwartz 1958, 99) simply does not, if readers will forgive us, wash. Nor are we persuaded that at A.D. 1150 the occupants of Havasu suddenly stopped trading for Anasazi pottery only to take it up again about 1300. Schroeder (personal communication) has suggested this possibility, arguing that the Sinagua functioned as "middle-men" between the Cohonina and the Anasazi, and that they left the area after 1150 thus disrupting trade between the two groups which was not reestablished until 1300. Pilles (personal communication) does not agree that the Sinagua left the area about 1150. Rather, he thinks they remained in the region until around 1200 when aggregation in larger settlements such as Elden Pueblo occurred, while others may have dispersed. Thus, accepting Pilles' view, there was no "middle-man hiatus" after 1150. The entire Sinagua "middle-man" argument may well be irrelevant in any case since evidence from the Tusayan Ranger District (Cartledge, personal communication) indicates that the Cohonina and Anasazi were in direct contact. In any event it seems to us that the explanation for what happened to the Cohonina after 1150 rests in explaining just that-- what happened to the Cohonina, rather than what was happening to the Sinagua.

Euler's (1976) survey of the Esplanade has produced no diagnostic artifacts dating from A.D. 1150 to 1300, nor did the survey reported here. This leaves for analysis the only other relevant body of data that^{which} was collected by Schwartz. In 1956 Euler examined, typed, and recorded counts of the ceramics from Schwartz's surface and excavated collections at Yale University. In April of 1978 Green and Euler reviewed Euler's records and agreed that evidence for a 1150-1300 occupation is absent. The material is clearly prior to 1150 and post 1300.

2. If, as we maintain, there was no grand migration to Havasu canyon after 1150, what then became of the Cohonina? Green has had to face the same problem in southeastern Utah. He argues that about 1150, a significant change in settlement pattern occurred in the Southwest. A pattern of scattered, smaller dwellings gave way to a trend toward aggregation in larger villages culminating eventually in the modern pueblos. In terms of the Pecos classification the real change in Southwestern prehistory occurred not between PIII and PIV but between PII and PIII. In southeastern Utah the evidence is most clearly illustrated from Milk Ranch Point (DeBloois 1975) where the largest and fewest sites are PIII. Gumerman and Euler (1976) see a similar phenomenon occurring on Black Mesa. Perhaps the Cohonina were involved in an aggregation phenomenon that was characteristic of much of the Southwest, but we would argue that the evidence for such aggregation must be found other than in Havasu Canyon where no settlements of the time period 1150-1300 (PIII) exist. Euler has personally examined every mile of the Canyon from its narrow southern end to Supai village with the exception of the few miles between Lee and Havatagvitch Canyons. Few springs or other water sources are known in this area. In fact the only area with enough water to support a village is Supai. The concentration of sites in the area surveyed and reported here was supported by High Wall Spring and a few seeps. So far as we are aware, the only two areas (Supai, High Wall Spring) in the canyon that could have supported an in-migration from the plateau are devoid of sites and artifacts from the time period in question.

3. Linguistically the Havasupai are Yuman speakers. Schwartz (1966, 479) maintains that, ". . . the Cohonina entered the plateau area from the west about A.D. 600 as the easternmost arm of a spread of Yuman peoples." If true, this would argue for the existence of Yuman speakers in the vicinity of Havasu canyon at an early date and would seem to support the Cohonina-Havasupai continuum even if the 1150-1300 cultural hiatus has not yet been satisfactorily explained. However, the notion that the Cohonina came from the west is based on a paper by Hargrave (1937) which defines the Cohonina on the basis of pottery alone. Furthermore, only two attributes are cited as the distinguishing features: manufacturing technique and firing.

With regard to manufacturing technique there is no problem. San Francisco Mountain Gray ware is clearly finished with a paddle-and-anvil technique (Colton and Hargrave, 1937; Colton 1958). However, Hargrave (1937, 56) states that, ". . . the earliest indigenous pottery. . . was fired in an oxidizing atmosphere." We are not sure to what pottery he is referring. Perhaps it is to Sinagua ceramics or Mogollon wares from Winona Village which he mentions in his following paragraph (Hargrave 1937, 56). Be that as it may, most Cohonina pottery is clearly fired in a reducing atmosphere (Colton 1958, Ware 18). Other Cohonina sherds appear to have been fired with little or no control over the firing atmosphere producing pottery which looks both reduced and oxidized sometimes on the same vessel. We believe the issue of firing is simply not as clear nor as diagnostic in this case as has been argued.

Pilles (personal communication) has maintained that vessel shape for the San Francisco Mountain Gray wares shows no relationship to the east. In April of 1978 Green and Pilles examined the whole vessel collections of San Francisco Mountain Gray ware and Cerbat ceramics at the Museum of Northern Arizona. This inspection revealed that vessel shapes for San Francisco Mountain Gray ware do not correspond to vessel shapes from Cerbat ceramics. The Cerbat collection in the Museum of Northern Arizona is limited to less than eight vessels which undoubtedly are not representative of the population of Cerbat ceramics. Nevertheless, based on the pottery we have seen thus far, our opinion is that there is no reason to derive Cohonina pottery from Cerbat pottery or visa versa, nor to assume that there is ^{any} other cultural relationship which would bring Cohonina pottery out of the west.

McGregor (1967: 117) speculated that disposal of the Cohonina dead was by cremation which is a western trait but there is no evidence for such a practice among the Cohonina. Smithwick (1977) has reported a solid body of data indicating flexed inhumation. Another trait which supposedly ties the Cohonina to the west rather than the east is architectural style. McGregor (1951, 1967) characterized the Cohonina as being different from the Anasazi based on presence of ramadas among the Cohonina and lack of deep pithouses or kivas, and masonry architecture. Our personal opinion is that the supposed lack of ramadas among the Anasazi is an artifact of the way Anasazi sites have been excavated until recent years, and does not constitute a valid difference. Cartledge (1978) has located some 101 Cohonina sites with pithouses, and 51 with masonry architecture and 18 sites with both. Some of the pithouses are at least a meter in depth

(Cartledge, personal communication) and could just as easily be kivas as pithouses. In any event, the data produced by Cartledge does not argue for ties with the Cerbat and suggests a much more Anasazi-like situation than previously supposed. We also point out that a more recent survey and excavation of Anasazi sites away from the great centers (Gumerman and Euler 1976; Lipe and Matson, DeBloois and Green, Lindsey *et. al.*, 1968) has shown the Anasazi cultural pattern to have had greater variability in many traits, including architecture, than was perceived in the 1950's when the concept of the Cohonina was being tested by excavation.

Of the several traits which have been used to argue a Cohonina development out of the Cerbat, only paddle-and-anvil technique of pottery manufacturing has any remaining credibility. The other traits employing negative evidence (lack of inhumations, therefore, cremation) or supposed differences from the Anasazi (architecture, settlement patterns) have not stood the test of time given: 1) our better understanding of "rural" Anasazi and, 2) the new information which has developed on the Cohonina in the past few years.

If the Cohonina did come from the west, one would expect some cultural traits other than ceramic manufacture to have accompanied them. Yet Euler (1958), whose work forms the basis for defining the Cerbat culture from whence the Cohonina presumably came, fails to find any cultural correspondences (Euler 1977). Green comes to the Cohonina with a background in the San Juan area and the Fremont. From his first introduction to the Cohonina involving the present survey and subsequent visits to a number of sites on the Plateau, he has had trouble seeing anything but reliance on the Anasazi cultural tradition. To him the Cohonina look like poor, country cousins of the Anasazi very similar to the Fremont peoples of Utah down to and including their fugitive red slip on the pottery.

Based on excavation at Harbison Cave, Jennings (1971) argues that the Cohonina developed out of a Desert Archaic pattern already on the Plateau. A position which is uncritically accepted by Ferg (1977) who argues for an archaic component at AZ:H:10:1 (ASM) on lithic morphology alone. While we are not convinced by Jennings tenuous obsidian hydration arguments that such in fact was the case, this notion is acceptable in principle to both Euler and Green and we would simply point out that if that was the case, the Cohonina developed their strongest cultural ties to the east. If they moved into the area, we think the Cohonina must have come from the east and simply adopted paddle and anvil ceramic manufacturing while the Anasazi eastward did not.

4. Dobyns and Euler (Dobyns 1956; Dobyns and Euler 1958; Euler 1958) have postulated that the Cerbat "branch" was directly ancestral to both the Havasupai and the Walapai; and prior to their being placed on reservations in the 1880's, they considered themselves as one tribe, the Pai.

The cultural similarities between the prehistoric Cerbat and the historic Pai are numerous. They both occupied essentially the same territory, especially after A.D. 1300, and had a subsistence economy based on horticulture, gathering and hunting. During much of the yearly economic round, they lived in rockshelters or brush wikiups as they seasonally moved from canyon bottoms to plateaus. There is no evidence that they built masonry structures as did the Cohonina.

Disposal of the dead for both Cerbat and Pai was by cremation, not by inhumation as the Cohonina practiced (Smithwick 1977). Indigeneous ceramics have been classified as Tizon Brown ware, an undecorated, oxidized, paddle-and-anvil finished pottery, unlike the reduced and frequently painted San Francisco Mountain Gray ware of the Cohonina.

Cerbat and Pai food reduction tools consisted primarily of flat sandstone milling stones with shallow, oval basins pecked in their surfaces and so-called "one hand" manos, not the troughed metates and "two hand" manos of the Cohonina.

Projectile points manufactured by the Cerbat-Pai were always small, triangular, concave based, with single or double side notches. Such a form is not typical in Cohonina sites.

All these characteristics point to a close Cerbat-Havasupai relationship and a series of shared traits quite distinct from those of the Cohonina. The ". . . striking similarities . . . in its general pattern of orientation. . . ." that Whiting (1958: 57) envisioned between Havasupai and Cohonina probably can be attributed to similar adaptations to the environment and may, indeed, not have been so striking as Whiting would have had us believe. One must remember that Whiting, writing in the 1950's, probably saw the Anasazi, as did most archeologists of that period, in terms of the great centers: Mesa Verde, Betatakin, Chaco Canyon. Only in the last two decades have archeologists begun to realize that most of the prehistoric population of the Southwest didn't live in the "great" centers (Jennings 1966). Our current understanding of dispersed settlement systems in the Southwest is a rather recent phenomena in Southwestern archeology (DeBloois 1975, Gumerman and Euler 1976, Hill and Plog 1977, Hays 1964, Jennings 1966, Winter 1976). Cohonina sites, when looked at in this light, appear only a little less Anasazi than those in the above studies.

Therefore, on the basis of: 1) lack of 1150-1300 occupation in Havasu Canyon, 2) Cohonina ties with the Anasazi to the east and not with the Cerbat to the west, and 3) Havasupai ties with the Cerbat; we reject the notion of a Cohonina-Havasupai continuum.

Additional Research Problem

In addition to the four research areas mentioned by Johnson and Hewitt (1977), we would like to call attention to an additional research issue. Since McGregor's work in the 1950's, the only excavations in the Cohonina area, of which we are aware, have been the salvage operations of Ferg (1977), Jennings (1971), and James (1977). So far as we know there is only one pollen analysis (Fish, 1977) and no flotation from a Cohonina site. The only statistical analysis attempted with Cohonina materials are the few Chi-squares run by Jennings (1971: 99). The Coconino Plateau has suffered an almost total neglect of research methods, techniques, and theory developed since 1960. This is especially true of excavation and was true of survey until the last two-three years.

Currently, and due largely to the efforts of the Kaibab National Forest, the Coconino Plateau is being surveyed at an increasing methodological ^{rate and with increasing} sophistication. Richard Effland and Arizona State University (work in progress) are conducting a sampling survey of the Tusayan Ranger District. Several individuals (Green, 1977) have conducted a number of small-scale surveys in connection with various National Forest projects. Cartledge (1978) has conducted an intensive survey of 6000 acres on Sitgreaves Mountain which represents the best comprehensive to date look of a large area on the plateau. While much of the small project work is conducted outside a sampling framework, the work of Effland and Arizona State University, as well as some timber sale surveys by Cartledge, Smith, and Wood (Green, 1977), are for the first time producing a valid representative sample of parts of the Coconino Plateau. The earlier transect surveys by Jennings (1971) and Ward (1976) while useful, cannot be used as a valid sample since the target population is unidentified.

Although the increase in survey activity is producing valuable information, there remains a hiatus in sound modern excavation. We believe that most, if not all, of the problems surrounding the cultural affiliation of the Cohonina are due to excavation bias and lack of application of modern problem orientation. It seems to us that the most pressing issue in Cohonina archeology in 1978 is the need for excavation of selected Cohonina sites bringing to bear modern archeological research and execution of those designs. Current survey work should provide an exceptional basis for designing excavation research to further our understanding of the prehistoric occupants of the Coconino Plateau.

REFERENCES

Breternitz, David A.

- 1966 An Appraisal of Tree-Ring Dated Pottery in the Southwest.
Anthropological Papers of the University of Arizona Number 10.
Tucson: The University of Arizona Press.

Brown, David E., and Charles H. Lowe

- 1974 "The Arizona System for Natural and Potential Vegetation--
Illustrated Summary through the Fifth Digit for the North
American Southwest." Journal of the Arizona Academy of
Science. Vol. 9. Supplement 3.

Carter, George F.

- 1945 Plant geography and culture history in the American
Southwest. Viking Fund Publications in Anthropology, 5.

Carter, George F., and E. Anderson

- 1945 A preliminary survey of maize in the Southwestern United States.
Annals of the Missouri Botanical Gardens. 32:397-324.

Cartledge, Thomas R.

- 1978 A Cultural Resource Survey of the Proposed El Paso Timber
Sale Chalender Ranger District Kaibab National Forest,
Arizona. USDA Forest Service, Southwestern Region.

Colton, Harold S.

- 1939a An Archaeological Survey of Northwestern Arizona Including
the Descriptions of Fifteen New Pottery Types. Museum of
Northern Arizona Bulletin 16. Flagstaff.
- 1939b Prehistoric Culture Units and Their Relationships in
Northern Arizona. Museum of Northern Arizona Bulletin 17.
Flagstaff.
- 1955 Pottery Types of the Southwest: Wares 8A, 8B, 9A, 9B.
Flagstaff. Museum of Northern Arizona Ceramic Series No. C.
- 1956 Pottery Types of the Southwest: Wares 5A, 5B, 6A, 7A, 7B, 7C.
Flagstaff. Museum of Northern Arizona Ceramic Series No. 3C.
- 1958 Pottery Types of the Southwest: Wares 14, 15, 16, 17, 18.
Museum of Northern Arizona Ceramic Series No. 3D. Flagstaff.

Coues, Elliott

- 1900 On the Trail of a Spanish Pioneer. New York: Francis P. Harper.

Cutler, Hugh C.

- 1956 Maize remains. In the Upper Pima of San Cayetano del Tumacacori, by C. C. DiPeso. The Amerind Foundation 7:458-463.
- 1963 Plant remains from a Grand Canyon Shelter Granary. American Antiquity 28 (3):301.

Cutler, Hugh C., and J. W. Bower

- 1961 Plant remains from several Glen Canyon sites. In Survey and excavations in Lower Glen Canyon, 1952-1958, by A. J. Lindsay, C. G. Turner II and W. Y. Adams. Museum of Northern Arizona Bulletin, 36.

DeBloois, Evan I.

- 1975 The Elk Ridge Archeological Project: A Test of Random Sampling in Archeological Surveying. USDA Forest Service, Intermountain Region, Archeological Report No. 2.

DeBloois, Evan I., and Dee F. Green

- 1978 SARG Research on the Elk Ridge Project Manti-LaSal National Forest, Utah. In Investigations of the Southwestern Anthropological Research Group: The Proceedings of the 1976 Conference, ed. by Robert C. Euler and George J. Gumerman. Museum of Northern Arizona, Flagstaff.

Dobyns, Henry F., and Robert C. Euler

- 1958 "Tizon Broen Ware." In Colton, Harold S. (ed) Pottery Types of the Southwest. Museum of Northern Arizona Ceramic Series No. 3D. Flagstaff.

Drucker, Phillip

- 1941 Culture element distributions: Yuma-Pima XVII. Anthropological Records, 6.

Euler, Robert C.

- 1958 Walapai Culture History. Ph.D. dissertation, University of New Mexico. Ann Arbor: University Microfilms.
- 1963 "Archaeological Problems in Western and Northwestern Arizona, 1962." Plateau, Vol. 35, No. 3, pp. 78-85, Flagstaff.

- 1975 "The Pai: Cultural Conservatives in Environmental Diversity." In Frisbie, Theodore R. (ed) The Collected Papers in Honor of Florence Hawley Ellis.
- 1976 Cultural Patterns in the Havasupai Use Land Grand Canyon National Park. MS on file Office of Anthropology Grand Canyon National Park.
- 1977 The Archaeology of West Central Arizona. In Press, Kiva.
- Ferg, Alan
- 1977 The Pineveta Tanks Site, Northwestern Arizona. Kiva, Vol. 43, No. 2, pp. 111-127.
- Fish, Suzanne K.
- 1977 Mule Shoe Bend Pollen Analysis. In, The Mule Shoe Bend Site: A Study of a Cohonina Lithic Quarry and Plant Processing Area. Museum of Northern Arizona Research Paper No. 9, Flagstaff.
- Gerstle, Andres I., and Sally T. Greiser
- 1977 Form and Function of Lithic Assemblages From the Grand Canyon. MS on file, Office of Anthropology Grand Canyon National Park.
- Green, Dee F. (compiler)
- 1977 Bibliography of Cultural Resource Reports Submitted to the Forest Service Southwestern Region Through 1976. USDA Forest Service Southwestern Region.
- Gifford, W.W.
- 1940 Culture Element Distributions: Apache-Pueblo XII. Anthropological Records. 4:1.
- Gumerman, George J. (ed)
- 1971 The Distribution of Prehistoric Population Aggregates. Prescott College Anthropological Reports 1.
- Gumerman, George J., and Robert C. Euler
- 1976 Papers on the Archaeology of Black Mesa, Arizona. Southern Illinois University Press. Carbondale.
- Hargrave, Lyndon L.
- 1937 "A New Sub-Culture in Arizona." Southwestern Lore. 3:3, pp. 54-57.
- 1938 "Results of a Study of the Cohonina Branch of the Patayan Culture in 1938." Museum Notes 11:6, Flagstaff, pp. 43-50.

Hayes, Alden C.

- 1964 The Archeological Survey of Wetherill Mesa, Mesa Verde National Park, Colorado. Archeological Research Series No. 7A.
National Park Service, Washington, D.C.

James, Charles D. III

- 1977 The Mule Shoe Bend Site: A Study of a Cohonina Lithic Quarry and Plant Processing Area. Museum of Northern Arizona Research Paper No. 9, Flagstaff.

Jennings, Calvin H.

- 1967 Excavations for Arizona Public Service Company of the Coconino Plateau and the Hualapai Indian Reservation: A Preliminary Report. Museum of Northern Arizona, Flagstaff.
- 1971 Early Prehistory of the Coconino Plateau, Northwestern Arizona. Ph.D. Dissertation, University of Colorado. Ann Arbor: University Microfilms (1972).

Jennings, Jessie, D.

- 1966 Glen Canyon: A Summary. University of Utah Anthropological Papers, No. 81. (Glen Canyon Series No. 31). Salt Lake City.

Johnson, David S., and James M. Hewitt

- 1977 An Archaeological Assessment of Cultural Resources Within the Havasupai Indian Reservation Additions. Office of Arid Lands Studies, University of Arizona, Tucson.

Kroeber, A. L.

- 1935 Walapai Ethnography. American Anthropological Association. Memoir 42.

Kuechler, A. W.

- 1964 Potential Natural Vegetation of the Conterminous United States. American Geographical Society Special Publication No. 36. New York.

Lindsey, Alexander J., Jr., J. Richard Ambler, M. A. Stein, and P. M. Mobler

- 1968 Survey and Excavations North and East of Navajo Mountain, Utah, 1959-1962. Museum of Northern Arizona Bulletin 45, Flagstaff.

Lipe, William D., and R. G. Matson

- 1971 Human Settlement and Resources in the Cedar Mesa Area, S.E., Utah. In the Distribution of Prehistoric Population Aggregates, ed. by George J. Gumerman. Prescott College Anthropological Reports 1:126-151. Prescott, Arizona.

Lowe, C. H., and D. E. Brown

- 1973 The Natural Vegetation of Arizona. Arizona Resources Information System, Phoenix.

McGregor, John C.

- 1950 "Excavation of Cohonina Sites, 1949." Plateau 22:4 pp. 68-74.
- 1951 The Cohonina Culture of Northwestern Arizona. University of Illinois Press, Urbana.
- 1967 The Cohonina Culture of Mount Floyd, Arizona. Studies in Anthropology, 5, University of Kentucky Press.

Price, William R.

- 1881 Report of a Reconnaissance Among the Hualapai and Ava Supai Indians. War Department. National Archives Record Group 75.

Schwartz, Douglas W.

- 1955 Havasupai Prehistory: Thirteen Centuries of Cultural Development. Ph.D. Dissertation, Department of Anthropology, Yale University, New Haven.
- 1956a "Demographic Changes in the Early Periods of Cohonina Prehistory." In Prehistoric Settlement Patterns in the New World, G. R. Willey, (ed.) pp. 26-31, New York.
- 1956b "The Havasupai 600 A.D.-1955 A.D.: A Short Culture History." Plateau, Vol. 28, No. 4, pp. 77-85, Flagstaff.
- 1957 "Climate Change and Culture History in the Grand Canyon Region." American Antiquity, Vol. 22, No. 4, pp. 372-377.
- 1958 "Prehistoric Man in the Grand Canyon." Scientific American, Vol. 198, No. 2, pp. 97-102, New York.
- 1959 "Culture Area and Time Depth: The Four Worlds of Havasupai." American Anthropologist, Vol. 61, No. 6, pp. 1060-1070.
- 1966 "A Historical Analysis and Synthesis of Grand Canyon Archaeology." American Antiquity, Vol. 31, No. 4. pp. 469-484.



1022575644

Shumate, Jon D., Landon D. Smith and Donald G. Wood

- 1975 An Archeological Survey of the Miller Seep Timber Sale,
Kaibab National Forest, Arizona. USDA Forest Service,
Southwestern Region.

Smithwick, James

- 1977 Summation of the Cohonina Skeletal Series at the Museum of
Northern Arizona. MS, Museum of Northern Arizona, Flagstaff.

Spier, Leslie

- 1928 Havasupai Ethnography. Anthropological Papers of the
American Museum of Natural History. XXIX:III. New York.

Wheat, Joe Ben and Pat Wheat

- 1954 "A Pueblo I Site at Grand Canyon." American Antiquity,
Vol. 19, No. 4, pp. 396-403.

Whiting, Alfred F.

- 1939 Ethnobotany of the Hopi. Museum of Northern Arizona
Bulletin 15. (reprinted 1950).

1958 "Havasupai Characteristics in the Cohonina." Plateau
30:3. Flagstaff, pp. 55-60.

Wilder, Carleton S.

- 1944 "Archaeological Survey of the Great Thumb Area, Grand Canyon
National Park." Plateau, 17:2, pp. 17-26, Flagstaff.

Winter, Joseph C.

- 1976 Hovenweep 1975. Archeological Report No. 2, San Jose
State University.

Wood, Donald G.

- 1975 An Archeological Survey of the Proposed Red Horse Salvage
Timber Sale, Kaibab National Forest, Arizona. USDA Forest
Service, Southwestern Region.

NATIONAL AGRICULTURAL LIBRARY



1022575644